A STUDY TO ASSESS THE EFFECTIVENESS OF PROBIOTIC SUPPLEMENTATION ON LEVEL OF ANAEMIA AMONG ADOLESCENT GIRLS STUDYING AT SELECTED SCHOOL TIRUVANNAMALAI

DISSERTATION SUBMITTED TO

THE TAMIL NADU DR.M.G.R.MEDICAL UNIVERSITY

CHENNAI

IN PARTIAL FULFILMENT OF REQUIREMENT FOR THE DEGREE OF

MASTER OF SCIENCE IN NURSING

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LIST OF ABBREVIATIONS

AAD	-	Antibody Associated Diarrhoea
ANOVA	-	Analysis Of Variance
BMI	-	Body Mass Index
EMRO	-	Eastern Mediterranean Region
CHERG	-	Child Health Epidemiology Reference Group
CMC	-	Christian Medical College
CINHAL	-	Cumulative Index of Nursing and Allied Health Literature
CNE	-	Continuing Nursing Education
GBD	-	Global Burden of Disease
f	-	Frequency
IBS	-	Irritable Bowel Syndrome
ICCR	-	International Centre for Collaborative Research
K Cal	-	Kilo Calorie
MEDLINE	-	Medical Literature On Line
NNMBS	-	National Nutritional Monitoring Bureau Survey
NH	-	Null Hypothesis
N.S	-	Non Significant
RCT	-	Randomized Control Trial
S.D	-	Standard Deviation
S	-	Significant
SCFA	-	Short Chain Fatty Acids
SPSS	-	Statistical Package for Social Science
UNICEF	-	United Nations International Child Emergency Fund
WHO	-	World Health Organization

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ABSTRACT

A study to assess the effectiveness of Probiotic supplementation on level of Anaemia among adolescent girls studying at selected school, Tiruvannamalai .

Introduction

Anemia is a major public health problem worldwide and is often ignored in both developed and developing countries. Preschool children, pregnant women and adolescents constitute vulnerable group of Anaemia. According to **World Health Organization (2010),** 4-5 billion people (66-80%) of the world's population, may be iron deficient. Among 2 billion people, over 30% of the world's population are Anaemic, mainly due to iron deficiency. In total, 800,000 (1.5 percent) of deaths worldwide are attributable to iron deficiency. Adolescence is a period of transition between child hood & adult hood, which begins from the age of 10 years to 19 years that is the second decade of life; they remain a largely neglected vulnerable group, difficult-to-measure, and hard-to-reach population in which the needs of adolescent girls are often ignored.

Iron requirements peak during adolescent period due to rapid growth and increase in blood volume. As adolescence is a vulnerable period, it has been focused by existing programmes to offset the added burden like menstrual blood loss, which precipitates the crisis often. Moreover, iron deficiency may be caused by parasitic infections, poor iron containing diet, poor absorption of iron even though the consumption of iron is normal. This study highlights the significance of Probiotic supplementation in enhancing the absorption of iron in adolescent girls .Probiotics creates an acidic environment for the absorption of iron, that increases the hemoglobin level and hence decreases the prevalence of Anaemia.

OBJECTIVES:

To assess the effectiveness of probiotic supplementation on the level of Anaemia among adolescent girls studying at selected school, Tiruvannamalai.

DESIGN:

Pre-test and Post-test design of Basic experimental design which comes under True experimental design..

SETTING:

Municipal Girls Higher Secondary School, located at Tiruvannamalai.

SAMPLING TECHNIQUE:

Simple Random Sampling Technique was used to select the Anaemic adolescent girls .30 were assigned to experimental group and 30 to control group.

PARTICIPANTS:

60 Anaemic adolescent girls between 15-18 years age, who fulfilled the inclusive criteria.

INTERVENTION:

Probiotic supplementation named Yakult, per bottle contains 65 ml of contents, which contains 6.5 Billion of Lactobacillus cascei strain Shirota, which was administered at 1.30 pm after lunch to the adolescent girls.

MEASUREMENT AND TOOL:

The level of Anaemia was assessed using cyanmethemoglobin method, and graded by WHO Anaemia grading scale.

RESULTS:

In comparison of the pre test and post test level of Anaemia among adolescent girls in experimental group, revealed that the calculated paired 't' value $t = 12.717$was found to be statistically significant at $p<0.001$ level. This clearly shows that the implementation of Probiotic supplementation had shown a significant reduction in the post test level of Anaemia among adolescent girls in the experimental group.

In comparison of post test level of Anaemia among adolescent girls between the experimental and control group revealed that the calculated unpaired 't' value of $t=8.872$ was found to be statistically significant at $p<0.001$which indicates that there

was difference in the post test level of Anaemia between the groups, this clearly shows that the administration of Probiotic supplementation had reduced the level of Anaemia in the experimental group .

CONCLUSION:

The Probiotic supplementation administered to the adolescent girls with Anaemia in experimental group had showed a significant reduction in the post test level of Anaemia, than the clients in the control group who were taking regular iron supplements as a part of School Health Services. Hence Probiotic supplementation can be used as a safe and effective dietary supplementation for adolescent girls with Anaemia.

IMPLICATIONS FOR CLINICAL PRACTICE:

The significant reduction in the level of Anaemia among the adolescent girls after the Probiotic supplementation suggests that the Nurses play an important role in creating awareness on Probiotic supplementation which enhances the absorption of iron and also educate and reinforce the parents about the health benefits of Probiotic supplementation. Further researches have suggested to determine Probiotic supplementation in promoting various health benefits to all age groups and also related studies could be conducted to assess the knowledge and practice of probiotic supplementation among the hospitalized clients with Anaemia.

CHAPTER – 1

INTRODUCTION

'A healthy body is a healthy mind.'

1.1 BACKGROUND OF THE STUDY

Blood sustains life and delivers oxygen, nutrients, other essential substances, including vitamins, minerals to the different cells and tissues of the body. A deficiency in the supply of blood will impair the quality of life and even compromise life itself**.** Red Blood Cell**,** which is the most common type of blood cell, contains haemoglobin**,** a molecule specially designed to hold oxygen and carry it to cells that need it. Anaemia has many causes; one of the most common is an inadequate intake of iron in the diet, associated with poor absorption of iron in the gut. The normal values of haemoglobin in men is 13.5-18g/dl and in females 12-16g/ dl.

Iron is obtained from food and dietary supplements. Approximately 1mg of every 10 to 20 mg of ingested iron is absorbed in the duodenum and upper jejunum. Therefore only 5% to 10% of ingested iron is absorbed, and when the stored iron is not replaced, haemoglobin production is reduced. Iron is of great importance in human nutrition. The adult human body contains between 3 - 4 g of iron, of which about 60-70 percent is present in the blood (Hb iron) as circulating iron, and the rest (1 to 1.5g) is stored in liver, spleen, bone marrow and kidney. Each gram of haemoglobin contains about 3.34mg of iron.

World Health Organization (2010) stated that Anaemia is a condition in which haemoglobin level is less than 12.0g/dl. Among 2 billion people over 30% of the world's population are Anaemic, mainly due to iron deficiency. In total, 800,000 (1.5%) of deaths worldwide are attributable to iron deficiency, 149 million people in the Eastern Mediterranean Region, western world and developing countries are estimated to be Anaemic.

Iron - Deficiency Anaemia can be the consequence of several factors, including insufficient iron in the diet, and poor absorption of iron by the body, ongoing blood loss most commonly from menstruation or from gradual blood loss in the intestinal tract,

periods of rapid growth. Iron continues to remain the most neglected micronutrient inspite of its greater burden on health. Symptoms of Iron Deficiency Anaemia include fatigue, weakness, shortness of breath, and the inability to concentrate.

WHO (2014) stated that, the statistical data of Anaemia worldwide affects 1.62 billion people which corresponds to 24.8%. The highest prevalence is in preschool-age children (47.4%), and the lowest prevalence is in men (12.7%). However, the population group within the greatest number of individuals affected is non pregnant women. Iron Deficiency Anaemia is most prevalent among females with the age group of 15-22yrs.

Global database by **WHO (2010)** on Child Growth and Malnutrition and National Family Health Survey-2 in India, had suggested that adolescent girls of urban, semi urban & rural schools in India are found to be Anaemic. The Anaemic prevalence rate was between 61.9% and 88.1%, highest among rural girls of higher order as compared to urban poor girls, irrespective of their age and menarcheal status. This could be due to difference in dietary habits, worm infestation, poor hygiene and poor sanitation. Anaemia prevalence was more among girls of low weight, height & BMR as compared to those who were heavier, tall and having higher BMR.

Adolescent girls face a greater risk of nutritional problems than adolescent boys, including anaemia and underweight. **UNICEF (2011**) stated that, India has the largest population of adolescents (243 million), followed by China (207 million) and United States (44 million), in that around 25 percent (243 million) of Indians belong to the age group of 11-19 years. More than half of adolescent girls aged 15-19 years (56%) in India are Anaemic.

District Human Development Report (2011), Government of Tamil Nadu, - states the Prevalence of anaemia in Tiruvannamalai district.

Adolescent girls	Tiruvannamalai	Tamil nadu
	78.1 %	**61.4%**

Anaemia is a major problem in Tiruvannamalai district. Government has been providing iron and folic acid tablets to address the issue, and above 95% of the girls are covered under National Iron Plus Initiative Programme.

The complication of Iron Deficiency Anaemia may go unnoticed and may have adverse effects on adolescent girls during their pregnancy period. It can also lead to a fall in academic performance with a drop in memory power and concentration level and a poor immune system. Iron Deficiency Anaemia may lead to a rapid or irregular heartbeat. Unchecked Anaemia can lead to Angina, Congestive cardiac failure and also there is a greater incidence for lead poisoning and an increased susceptibility to infections.

National Family Health Survey (2010) stated that, menstruating women have a considerable need for iron, when iron deficiency occurs the body can increase its absorption of iron, but often not to a degree that is sufficient for the deficiency to disappear. This means that there is a large need for nutritional supplements that promote iron absorption. One alternative for people with iron deficiency is to take medication with high iron content, but these often have side-effects in the form of gastric discomfort. Taking Probiotic supplements has been demonstrated to reduce gastric problems and improve gut health, and consequently increase iron absorption, by managing the colonic microbial population. Hence the term "Probiotic", refers to foods or supplements containing live beneficial microbes, primarily bacterial strains that are used to fortify or rebuild natural gut flora. This is traditionally done by the consumption of probiotics, live microbial food supplements. Prebiotics have the ability to support the growth of probiotics. The fermentation of probiotics by colonic bacteria gives rise to production of unbranched SCFA such as acetic, propionic, butyric, and lactic acids, thereby lowering intestinal pH, inhibiting the growth of potentially harmful bacteria and improving mineral absorption.

1.2 NEED FOR THE STUDY:

The word Adolescence comes from the Latin word adolescere, which means "to grow" or "to mature". Adolescence is a period of transition when the individual changes physically and psychologically from a child into adult. Adolescence stage is accomplished by its profound changes in growth rate, body composition and marked physiological and endocrinal changes. Adolescent girls are very important section of our society as they are our potential mothers and future homemakers, so it is essential to protect and prevent them from the future risks.

Adolescence is considered as a nutritionally critical period of life. They are vulnerable to both macro and micro-nutrient deficiencies. Iron Deficiency Anaemia is one of the micro-nutrient deficiencies which cause a major public health problem, especially in developing countries like India. It leads to deleterious consequences in health, welfare, social and economy. The pre-pregnancy nutritional status of young girls is important as it impacts on the course and the outcome of their pregnancy. Hence, the health of adolescent girls demands special attention. There is also evidence that Anaemia may result in reduced growth & increased morbidity and mortality during the perinatal period and greater efforts are needed to develop and implement programs, both to prevent & control Iron Deficiency Anaemia in the adolescent girls.

Park, K (2011) stated that Iron Deficiency Anaemia is a major nutritional problem in India, the world's highest prevalence of Iron Deficiency Anaemia was among women, with 60 to 70 percent of the adolescent girls being Anaemic. 20-40% of natural deaths are due to Anaemia during pregnancy.

WHO (2011) titled "Preventing risk, Promoting healthy life" mentioned iron deficiency as the 9th of 26 preventable risks to disease, disability and death in the world today. The goal of Anaemia control strategy in twelfth five year plan (2014-2019) is to reduce Anaemia in girls and women by 50%. Nutritional Anaemia is one of India's major public health problems. The prevalence of Anaemia ranges from 33% - 89% among pregnant women and is more than 60% among adolescent girls. It is prudent to recommend the correction of iron stores before the women become pregnant. Efficacy of weekly supplementation of iron has been proved to improve iron stores in adolescence period.

The Indian Council for Medical Research (2013), conducted a district nutrition survey and reported Anaemia prevalence of about 84.2%, of which, 13.1% being severe among the adolescent girls.

National Iron Plus Initiative Guidelines Programme (2013), established Iron and Folic acid Supplementation for adolescent girls between 10-19 years, (400mg of

elemental iron and 0.5µg of folic acid) for 52 weeks each year and Albendazole (400mg) tablets biannually for deworming of helminthic control.

Global burden of disease (2011) report states that, iron deficiency is considered to contribute death & disability. On average, globally 50% of Anaemia is assumed to be attributable to iron deficiency, which ranks among 26 risk factors, and accounts for 8,41,000 deaths & 35,057,000 disability adjusted life. There is an urgent need to develop effective & sustainable intervention to control Iron Deficiency Anaemia.

Appropriate preventive measures will be the best solution to decrease the prevalence rate of Anaemia among adolescent girls and there are three possible interventions for the prevention of Anaemia. These include dietary diversification, food fortification and individual supplementation. Dietary diversification involves promotion of a diet with a wider variety of iron containing food, and adding fermented foods in diet will improve the haemoglobin status, also encouraging families with deficient iron intake, to eat meat, fish, or poultry, whole or enriched grain, fermented dairy products and vitamin C rich foods.

FAO/WHO (2010) defined Probiotic as live micro-organism, which, when administered in adequate numbers confer a health benefit on the host. The major groups of probiotics are Lactobacilli, Bifidobacteria and minor group is represented by Saccharomyces, Streptomyces, E. coli.

Probiotics Acts On Intestine In The Following Ways:

- Acidophilus and other Probiotic bacteria secrete antiviral, antibacterial and antifungal chemicals.
- Acidophilus create an acidic micro environment, which promotes iron and other mineral absorption.
- Probiotics form a physical barrier to hinder invasion of bacteria and yeasts.

Currently, Probiotics are available as commercial tinned food products in the brand name YAKULT, which contains 6.5 billion of lactobacillus casei shirota. 65ml

bottle of YAKULT contains, 42.9 kcal of energy, 0.9 gm of protein, 9.6 gm of carbohydrate, 0.1 gm of fat, 0 gm of fibre, 0.01gm of sodium.

YAKULT is a fermented product that forms short chain fatty acids (SCFA), which releases iron from complexes by lowering the pH. Furthermore SCFA increase the absorption area by stimulating the epithelial cells to proliferate. Probiotics gives a reducing environment where iron can be reduced to more soluble form. Probiotics gives a regulation of the genes, encoding for iron transporters and receptors.

Han (2011) states that, factors enhancing the bio-availability of nonhaem iron are ascorbic acid, lactic acid and citric acid, which reduces the ferric iron to ferrous form, where ferrous iron is more soluble and absorbable than ferric iron. This helps in promoting the iron up take in the gut. Lactic acids may also delay gastric emptying that increases the iron exposure to the proximal intestinal epithelium which leads to increased iron absorption.

Per Bengtsson (2013) conducted various studies to assess the benefits of Probiotic bacteria. Researcher stated that Probiotic bacteria can double the iron absorption. Intake of Acidophilus daily can help in promoting iron absorption. In the intestine, the pancreas pours a very alkaline fluid into the upper small intestine making the whole contents alkaline because the digestive enzymes work best in an alkaline state. This creates a problem for mineral absorption, where the Lactic acid bacteria intimately involve in food fermentation. The capacity of lactic acid bacteria to produce organic acids has more chances for iron absorption, in that their acidifying properties are favourable for the solubility of iron in iron-ligand complexes. The study findings suggest that there exists a connection between probiotics and iron, where the fermented lactic acid bacteria increases iron absorption.

The Investigator, when posted in clinical and community area, found that the adolescent girls had severe Anaemia due to decreased dietary intake of iron and poor absorption of iron which lead to amenorrhoea and severe life threatening complications. Investigator felt the need for dietary intervention to enhance the iron absorption. This motivated the investigator to conduct the study, to assess the effectiveness of Probiotic

supplementation in enhancing the iron absorption, and to increase the haemoglobin level, thereby reducing the prevalence of Anaemia among adolescent girls.

1.3 STATEMENT OF THE PROBLEM

A study to assess the effectiveness of Probiotic supplementation on level of Anaemia among adolescent girls studying at selected school, Tiruvannamalai.

1.4 OBJECTIVES

1. To assess the pre test level of Anaemia among adolescents girls in experimental and control group.
2. To assess the post test level of Anaemia among adolescents girls in experimental and control group.
3. To compare the pre and post test level of Anaemia among adolescent girls in experimental group.
4. To compare the pre and post test level of Anaemia among adolescent girls in control group.
5. To compare the pre test level of Anaemia among adolescent girls between experimental and control group.
6. To compare the post test level of Anaemia among adolescent girls between experimental and control group.
7. To determine the association in the pre and post test mean difference level of Anaemia among adolescent girls with their selected demographic variables in experimental group.
8. To determine the association in the pre and post test mean difference level of Anaemia among adolescent girls with their selected demographic variables in control group.

1.5 OPERATIONAL DEFINITIONS

Effectiveness

It is the outcome of probiotic supplementation in terms of change in the level of Anaemia as measured by cyanmethaemoglobin method.

Probiotic Supplementation

It is a commercially available product named Yakult comes in 65ml container in liquid form given in single dose orally to the subjects at 1.30 pm, after lunch which contains 6.5 billion of Lactobacillus casei Shirota, per bottle contains, 42.9 k cal of energy, 0.9 gm of protein, 9.6gm of carbohydrate, 0.1 gm of fat,0 gm of fibre,0.01gm of sodium.

Probiotics

Probiotics refers to harmless and beneficial micro-organism in sufficient number that alters the micro flora and creates an acidic micro environment in the intestine which promotes iron and other mineral absorption.

Anaemia

Anaemia is a physiological condition in which the haemoglobin level is decreased to 8.0- 10.9 gm/dl, which is measured by cyanmethaemoglobin method.

Adolescent girls

Females between the age group of 15 -18 years.

1.6 ASSUMPTIONS

1. Adolescent girls may have Iron Deficiency Anaemia.
2. Probiotic supplementation may increase the iron absorption thereby increases the blood haemoglobin level.

1.7 NULL HYPOTHESES

NH_1- There is no significant difference between the pre test and post test level of Anaemia among the adolescent girls in experimental group at $p < 0.05$

NH_2- There is no significant difference between the pre test and post test level of Anaemia among adolescent girls in control group. at $p < 0.05$

NH_3- There is no significant difference in the post test level of Anaemia among adolescent girls between experimental and control group at $p < 0.05$

NH_4- There is no significant association in the pre and post test mean difference level of anaemia among adolescent girls with their selected demographic variables in experimental group at $p < 0.05$

NH_5- There is no significant association in the pre and post test mean difference level of anaemia among adolescent girls with their selected demographic variables in control group at $p < 0.05$.

1.8 DELIMITATIONS

1. The study is delimited to a period of 4 weeks.
2. The study is conducted in selected setting only.

1.9 CONCEPTUAL FRAMEWORK

A conceptual framework or model refers to interrelated concepts or abstractions assembled together in a rational scheme by virtue of their relevance to a common theme that structure or offer a framework for conducting research.

The Investigator adopted IMOGENE KING'S GOAL ATTAINMENT THEORY, as a basis for conceptual framework, which was aimed to assess the effectiveness of Probiotic supplementation on level of Anaemia among adolescent girls. According to this theory, two people come together to help or to be helped to maintain a state of health where they communicate information, establish goals, and take action to attain goals. Here the investigator and the adolescent girls come together were Probiotic supplementation is administered. This framework consists of six major concepts that describe the phenomena.

Perception

Refers to personal representation of reality. It gives meaning to one's experience and represents one's image of reality and influences one's behaviour. Here the investigator perceives that adolescent girls are Anaemic, and the adolescent girls perceive that they need to know the level of Anaemia.

Judgement

Individuals come together for a purpose. Each person makes a judgment, takes mental or physical action, and reacts to the other individual and the situation. The investigator judges that Probiotic supplementation may enhance the iron absorption. Adolescent girls understand the importance of Probiotic supplementation and planned to co–operate with the investigator.

Action

Individual transfers the perceived energy as demonstrated by observable behaviour by performing mental and physical action. Investigator administers the Probiotic supplementation in order to increase the iron absorption. The adolescent girls were willing and ready to take Probiotic supplementation by actively participating in the study.

Reaction

The investigator and the adolescent girls set mutual goals. Reaction refers to the development of action and acting on perceived choices for goal attainment. The mutual goal setting was done with a belief that Probiotic supplementation will increase the iron absorption of adolescent girls. Here the investigator conducts a pretest to assess the level of Anaemia by using the cyan methaemoglobin method.

Interaction

Refers to an interaction with different set of values, ideas, attitudes, and perceptions to exchange. Here the investigator assess the pre test level of Anaemia using cyanmethaemoglobin method and administers Probiotic supplementation for the adolescent girls, followed by assessing the post test level of Anaemia by using cyan methaemoglobin method.

Transaction

Refers to mutually identified goals of two or more individuals and the means to achieve them. At this stage the investigator analyzes the post test level of Anaemia of the adolescent girls. For positive outcome i.e., significant change in the level of Anaemia. For negative outcome- i.e., no change in the level of Anaemia.

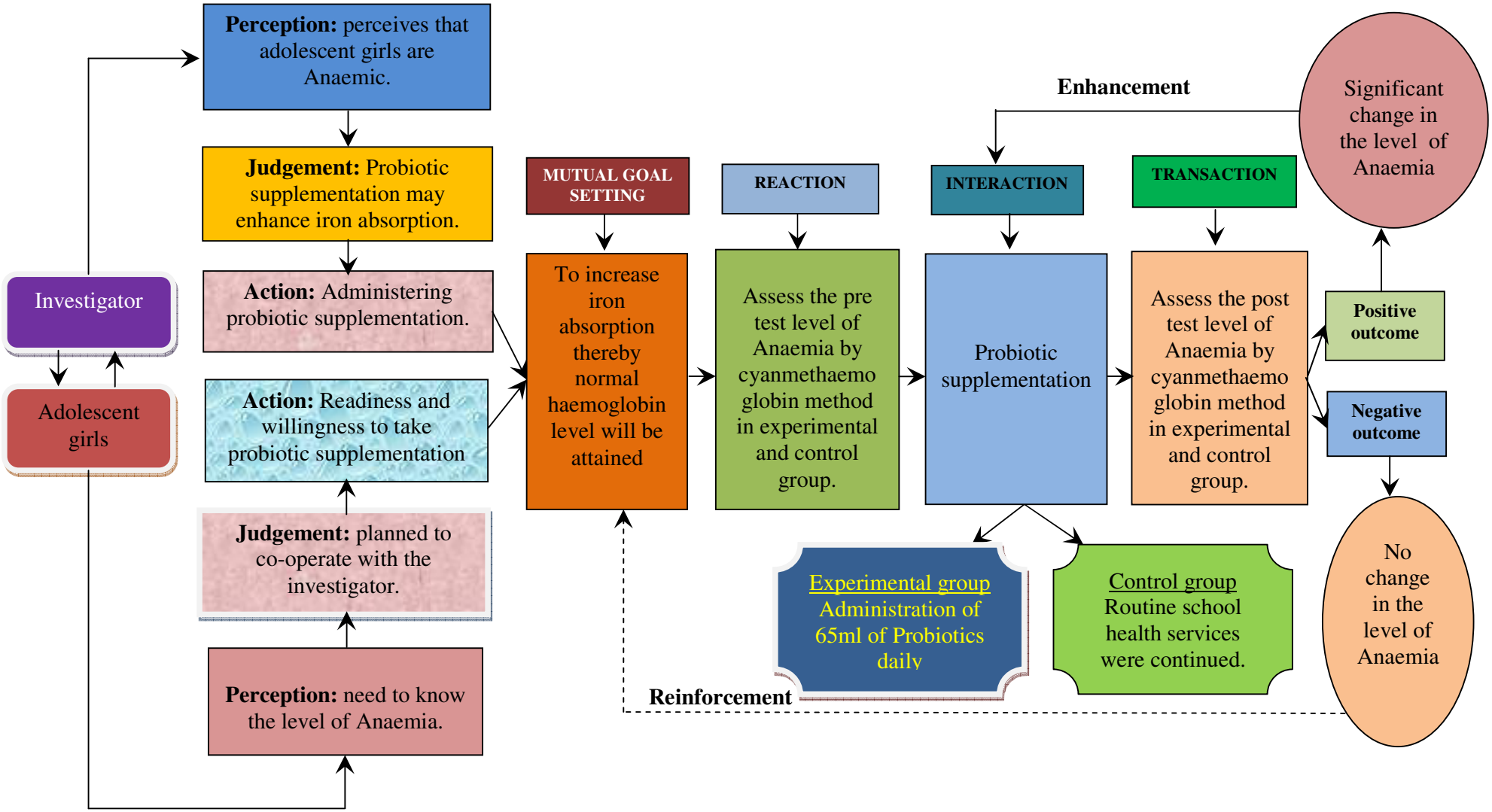


Fig.1.1.1: Conceptual framework based on Imogene King's Goal Attainment Theory

CHAPTER – 2

REVIEW OF LITERATURE

The review of literature is an essential aspect of scientific research. Its entails the systematic identification, reflection, critical analysis and reporting of existing information in relation to the problem of interest .the purpose of review of literature is to obtain comprehensive knowledge and in-depth information about the effectiveness of probiotic supplementation on level of Anaemia among Adolescent girls.

Review of literature is a systematic study of a number of previous studies which help to support the research work done .It includes all types of studies .It gives an idea of how the study can be conducted and what is to be done for it .

The review of literature is organized under the following sections

Section 2.1: Reviews related to Iron Deficiency Anaemia

Section 2.2: Reviews related to ill effects of Iron Deficiency Anaemia

Section 2.3: Reviews related to various health benefits of probiotics.

Section 2.4: Reviews related to effect of probiotic supplementation on level of Anaemia.

Section 2.1: Reviews related to incidence of Iron Deficiency Anaemia

Mulugeta Melku, (2013) conducted a cross sectional study to assess the Prevalence and Predictors of nutritional Anaemia among adolescent girls, from March 1 to April 30, 2012, on 302 adolescent girls at Gondar district, Northwest Ethiopia. Interview-based questionnaire, clinical history, and laboratory tests were used to obtain data. Bivariate and multivariate logistic regression was used to identify predictors. The study results suggests that the prevalence of Anaemia was 16.6%. Majority were mild type (64%) and morphologically normocytic normo chromic (76%) Anaemia, Low family income, large family size, hookworm infection were independent predictors of Anaemia. The study concludes that the prevalence of Anaemia was high where the mild type and normocytic normo chromic Anaemia was dominant and low income, large family size, hookworm infection, and HIV infection were associated with Anaemia. Study states that efforts should be made for early diagnosis and management of

hookworm infection with special emphasis on those having low income and large family size.

Premalatha (2012) conducted a cross-sectional survey to estimate the prevalence of Iron Deficiency Anaemia among adolescent school girls, and to study the associated factors, among 400 female school students in the age group of 13-17 years in Chennai. Sociodemographic details, anthropometric measurements were obtained. Haemoglobin was estimated using cyanmethaemoglobin method. Statistical analysis was done using IBM SPSS. Analysis revealed that the prevalence of Anaemia was found to be 78.75% among school students. Chi-square statistics shows significant association ($p<0.05$) of Anaemia with type of family, socioeconomic status and diet. Study findings revealed that 42.5% of girls with BMI<18 were found to be Anaemic and study concludes that a high prevalence of Anaemia was found in female students from nuclear families and whose mother's education is low.

Sudhagandhi. B (2011) Conducted a cross sectional survey to estimate the prevalence of Anaemia and its correlation to variables such as age, gender and body mass index in school children of Kattangulathur, Tamil Nadu, A total of 900 children in the age group of 8-16 years were included in this study. Parental consent was obtained in the written format. Blood was collected by finger prick and the haemoglobin was determined by cyanmethaemoglobin method. A preplanned questionnaire was used to collect the health details of the children. The children were grouped according to the age. Analysis of the study population reveals that 52.88% were Anaemic, girls (67.77%) were 32.2% higher than the boys (35.55%) and Anaemic children were underweight. Therefore study findings concluded that all the school children should be screened periodically and appropriate measures should be taken.

Siddaram S.M (2011) conducted a cross sectional study to estimate the prevalence of Anaemia among adolescent girls in selected anganwadi centres of rural area of Hassan district and to study the socio demographic factors associated with Anaemia, a total of 314 adolescent girls, between the age group of 10 -19 years were included in the study . Data analysis was done by using proportion and chi square tests.The study results shows that the prevalence was found to be 45.2%, among them 40.1% of Anaemic adolescent girls were mild Anaemic, 54.92% had moderate Anaemic,

4.92% had severe Anaemia, of which Anaemia was higher in low socio economic strata, the study concludes that Anaemia affects overall nutritional status of adolescent girls.

Sanjeev M Choudary (2010) conducted a cross sectional survey on the prevalence of Anaemia among adolescent females and to study the socio-demographic factors in an urban area of Nagpur, A total of 296 adolescent females (10–19 years old) were included in this study. The study took place for 6 months. Statistical analyses were done and the prevalence of Anaemia was found to be 35.1%. A significant association of Anaemia was found with socio-economic status and literacy status of parents. Mean height and weight of subjects with Anaemia was significantly less than subjects without Anaemia. A high prevalence of Anaemia among adolescent females was found, which was higher in the lower socio-economic strata and among those whose parents were less educated. It was seen that Anaemia affects the overall nutritional status of adolescent females.

Nalwade Vijaya (2008) conducted a quasi experimental study to assess the nutritional intervention for iron and vitamin A deficiency among 70 adolescent girls, between the age group of 12 -18 years in Prabani. The objective of this study is to assess the prevalence of Anaemia among the adolescent girls after nutritional supplementation. Anthropometric measures, clinical signs and symptoms of nutritional deficiency disorders were assessed and 7 hours recall method was used to assess the food intake of the girls .Iron and Vitamin A supplementation were supplemented to them for 90 days ,after which post test was done results proved that, there was a decrease in the prevalence of Anaemia (48%), Vitamin B deficiency (30%) and Vitamin A deficiency (28.11%) among the experimental group ,there was no significant difference in the control group. The study findings concluded that there was a significant improvement seen in the experimental group at $P < 0.001$after the interventions.

Raja Rathinam S (2001) conducted a cross sectional survey on the prevalence of Anaemia among adolescent girls of rural Tamil Nadu, the respondents includes 155 young girls aged 13-19 years old, their blood was extracted to assess the haemoglobin concentration, the other data obtained includes demo graphic variables, socio economic status, and nutritional status. Results indicated that prevalence of Anaemia among adolescent girls was 44%, of these 2.1% was severe, 6.3%moderate, and 36.5% were

mild Anaemic, prevalence of Anaemia exists in 40.7% of pre menarche girls, and 45.2% in post menarchial girls. The study findings concluded that educational level of the respondents and their mothers had significant association with the concentration of haemoglobin, however other indicators of nutritional status and socio economic status are of significant predictors. Iron reserve in female result better reproductive outcome. Overall the study illustrates that intervention programme are needed to increase the haemoglobin level among adolescent girls.

Section 2.2: Reviews related to ill effects of Iron Deficiency Anaemia

Sarika More, Nitin Gangane (2013) conducted a comparative study to assess the effect of iron deficiency on cognitive functions in Anaemic iron deficient and non-Anaemic iron deficient school girls between age group of 12–15 years studying in sixth to ninth standard. Serum ferritin concentration was estimated. For assessing the cognitive and verbal learning and Intelligent Quotient scores of the students were used. Study findings concluded that scholastic performance, Intelligent Quotient and scores of mental balance, attention & concentration, verbal memory and recognition were decreased in iron deficient girls, both Anaemic and non Anaemic as compared to the non iron deficient girls

Mu-Hong Chen, **Tung-Ping Su (2013)** conducted a Randomized control trial study to Associate between psychiatric disorders and iron deficiency Anaemia among children and adolescents in China, A total of 2957 patients with a diagnosis of Iron Deficiency Anaemia, were identified and compared with age and gender-matched controls (1:4) mental status examination ,encephalogram scans and various investigations were done and the study results reveals that and there is an increased risk of unipolar depressive disorder, bipolar disorder, anxiety disorder, autism spectrum disorder, attention deficit hyperactivity disorder, tic disorder, developmental delay, and mental retardation were identified and a gender effect was noted, were only female patients with IDA had an increased bipolar disorder and tic disorder, the study findings concluded that Iron deficiency increased the risk of psychiatric disorders, including mood disorders, autism spectrum disorder, attention deficit hyperactivity disorder, and developmental disorders. Further study is required to clarify the mechanism in the association between IDA and psychiatric disorder.

Tarun Gera, Sachdev, Penelope Nestel (2007) conducted a systematic review of randomised controlled trial to evaluate the effect of iron supplementation on physical performance in children (0-18 years) that included oral or parenteral iron supplementation, fortified formula milk, or cereals were evaluated. The physical performance outcomes studied were heart rate, treadmill endurance times, and blood lactate levels. The results revealed**,** Blood lactate levels were significantly lower in iron supplemented group in comparison to placebo at $p<0.05$. Treadmill endurance time was significantly better in iron supplemented group when compared with placebo. Iron supplementation may have a positive effect on the physical performance of children, as evaluated through the post exercise heart rate in Anaemic subjects, blood lactate levels and treadmill endurance time.

Sen A, et al., (2005) conducted a study to assess the physical work capacity and cognition of under privileged Anaemic adolescent school girls with regard to their haemoglobin status, physical work capacity and cognitive functions. Schoolgirls from four municipal primary schools in the age of 9 – 14 years were studied, haemoglobin of subjects was assessed using standard methods; physical work capacity using Modified Harvard's Step test and cognitive functions using selected tests from the modified Wechsler Intelligence Scale for Children, suitably adapted for this group (n = 230), the significantly lower scores in digit span and visual memory test were seen in Anaemic compared to non-Anaemic girls at the level of ($P<0.001$). The study findings concludes that Anaemia adversely affect physical work capacity and cognition in young adolescent girls undergoing pubertal development. Further research should be conducted in both school and community based settings to cover non-school going children.

Jere D. Haas and Brownlie IV (2001) conducted a study to assess the causal relationship between iron deficiency and physical work capacity through a systematic review of the research literature. Iron deficiency was examined along a continuum from Severe Iron-Deficiency Anaemia to Moderate Iron-Deficiency Anaemia to iron deficiency without Anaemia. Work capacity was assessed by aerobic capacity, endurance, energetic efficiency, voluntary activity and work productivity. Results suggest that there is a strong causal effect of Severe Iron-Deficiency Anaemia and Moderate Iron-Deficiency Anaemia on aerobic capacity in the subjects. The study findings concluded that, social and economic consequences of Iron-Deficiency Anaemia

and Iron Deficiency without Anaemia need to be evaluated. The biological mechanisms for the effect of Iron-Deficiency Anaemia on work capacity suggest the need for interventions to improve iron status as a means of enhancing human capital.

Section 2.3: Reviews related to various health benefits of probiotics:

Khalesi et al (2014) conducted a Systematic Review and Meta-Analysis of Randomized, Controlled Trials- effect of probiotics on Hypertension. Researchers included nine RCTs with 543 participants in total. Six of the trial consisted of 20 -40 participants. Some trials involved healthy people; others included patients with hypertension (high blood pressure), hypercholesterolemia (high levels of cholesterol in the blood), metabolic syndrome (a combination of diabetes, high blood pressure and obesity) or who were overweight or obese. Trials used were yoghurt, fermented and sour milk, probiotic cheese, encapsulated supplements or rose-hip drinks. The trials were given single species and three species of probiotic at the same time, and the daily dose of probiotics varied between 10^9 colony-forming units and 10^{12} colony-forming units. The duration of the trials varied from three weeks to nine weeks. The study findings stated that consuming probiotics may decrease high blood pressure to a modest degree.

Laval Professor Angelo Tremblay et al., (2014) has conducted a descriptive study to determine the consumption of probiotics on resetting the balance of the intestinal micro biota in favour of bacteria that promote a healthy weight. Researchers recruited 125 overweight men and women. The subjects underwent a 12-week weight-loss diet, followed by a 12-week period aimed at maintaining body weight, half the participants swallowed 2 pills daily containing probiotics from the Lactobacillus rhamnosus family, while the other half received a placebo after the 12-week diet period. The study results revealed that there is an average weight loss of 4.4 kg in women in the probiotic group and 2.6 kg in the placebo group. However, no differences in weight loss were observed among males in the two groups. After the 12-week maintenance period, the weight of the women in the placebo group had remained stable but the Probiotic group had continued to lose weight, for a total of 5.2 kg per person. In short, women consuming probiotics lost twice as much weight over the 24-week period of the study. The study finding concludes that, probiotics may act by altering the permeability of the intestinal wall.

Hungin AP, et al., (2013) conducted a randomized, placebo-controlled trials study to assess Probiotics in the management of lower gastrointestinal symptoms in clinical practice. 37 studies with irritable bowel syndrome or antibiotic-associated diarrhoea were included. Specific probiotics helps to reduce overall symptom burden and abdominal pain in some IBS patients, specified probiotics are helpful as adjuvant to reduce the duration of AAD; specific probiotics help relieve overall symptom burden in some patients with diarrhoea-predominant IBS, and reduce bloating/distension and improve bowel movement frequency in some IBS patients and some probiotics, improved symptoms that led to improvement in quality of life. The study finding concludes that specified probiotics can provide benefit in IBS and antibiotic-associated diarrhoea.

Kirsten Tillisch, et al., (2013) conducted a experimental study to assess the effectiveness of probiotic bacteria for effective brain function. A total of 36 women between the ages of 18 and 55 were included in the study. They were split into three different groups, Group one had consumed yogurt containing a mix of several probiotics twice a day for four weeks Group two consumed a diary product that contained no probiotics group three ate no product at all, in order to look at the brains of the women in a state of rest and in response to an emotion-recognition task the researchers conducted Functional Magnetic Resonance Imaging (FMRI) scans before and after the four week study period. The emotion-recognition task involved making the women look at pictures of angry or frightened faces and matching them to other faces with the same expressions. This measured the affective and cognitive brain regions response to visual stimulus. Women who consumed the probiotic yogurt had decreased activity in emotion-, cognition- and sensory-related areas of the brain compared to those in the two other groups. The results stated that in resting state, women consuming probiotics had shown more connectivity between an important brainstem region called the periaqueductal grey and areas of the prefrontal cortex responsible for cognition. The study findings concluded that brain effects occurred in various different regions, including those that have nothing to do with emotion, such as sensory processing after consumption of probiotics.

Jennifer Apple Gate et al., (2013) conducted a randomized control trial study to assess the effectiveness of probiotics for the treatment of community-acquired acute diarrhoea in children. Data were abstracted into a standardized table and study quality

was assessed using the Child Health Epidemiology Reference Group (CHERG) adaption of the GRADE technique. The study measured the relative effect of probiotic treatment, recommended rehydration on hospitalization, duration and severity, and a meta-analysis performed for discrete outcomes. 8 studies were identified for inclusion in the final database. No studies reported diarrhoea mortality and overall the evidence was low to moderate quality. Probiotics reduced diarrhoea duration by 14.0% and stool frequency on the second day of treatment by 13.1%. The findings proved that there is evidence to support Probiotics as an efficacious in reducing diarrhoea duration and stool frequency during diarrhoea episode.

Sazawal et al., (2012) conducted a Meta-analysis study on the efficacy of Probiotic in the prevention of acute diarrhoea. This analysis included 34 randomized, placebo-controlled trials evaluating of the effect of Probiotic in various acute diarrheal states, including antibiotic-associated diarrhoea (n=19) and travellers diarrhoea (n=6) and other acute diarrhea (n=9). The majority of the studies evaluated lactobacilli species. Twelve trials were in children (≤18 years), and 21 trials were in adults (>18 years). Overall 28 of the 34 trials yielded protective point estimates of which 10 attained statistical significance and 6 trials had statistically no significance no protective point estimates. The study results proved that Probiotic were associated with a 35% reduction in the risk for diarrhoea with substantial heterogeneity at $p<0.01$.

Gosse link et al., (2010) conducted a randomized control study to assess the effectiveness of Probiotics on ulcerative colitis, were 117 ulcerative colitis patients admitted and treated with intestinal resection and ileal pouch anal anastomosis. Lacto bacillus, rhamnosus GG significantly reduced the number of first episodes of pouchitis in the 39 patients who received the probiotics daily when compared with the 78 who did not ($p=0.011$). Finally, the results suggests that probiotics for the management of pouchitis in patients who underwent ileal pouch anal anastomosis yielded an odds ratio of 0.04 in favor of the treatment group ($P<0.0001$). The study suggests that probiotics can provide considerable benefit in this patient population.

Moayyedi et al., (2008) conducted a meta-analysis on clinical trials of probiotics in the treatment for IBS patients. 18 randomized controlled clinical trials enrolling 1,650 patients with IBS were identified examining products including Lactobacillus (6

studies), Bifid bacterium (3 studies), streptococcus (1 studies) and various combination products (9 studies). Probiotics significantly reduced IBS symptoms. Fifteen trials reported outcomes as a continuous variable when grouped for meta-analysis, these trials also found that probiotics had a statistically significant effect in improving IBS symptoms compared with placebo. Studies has shown a little difference among different types of probiotics, with Lactobacillus (3 trials enrolling 140 patients), Bifid bacterium (2 trials enrolling 422 patients), Streptococcus (1 trial enrolling 54 patients), and various combination products (4 trials enrolling 302 patients). Study results stated that probiotics had a statistically significant effect on improving pain scores and flatulence, as well as a trend toward improvement of bloating.

Section 2.4: Reviews related to effect of probiotic supplementation on level of Anaemia

Children's Hospitals and Clinics of Minnesota (2013) conducted a A Double-blind, Randomized Controlled Study, to assess the effectiveness of probiotics in the Treatment of Iron Deficiency in Children with Restless Leg Syndrome, California .One hundred children with diagnosis of RLS recruited over a two- year period. and Change in Ferritin and CRP and Restless Leg Questionnaire was assessed, The study proposed to compare the standard treatment for iron deficiency in children (supplemental iron with vitamin C)with RLS to supplemental iron plus vitamin C plus probiotics lactobacillus plantarum 299 (1x10x8 colony forming units). The study findings concluded that probiotics have improved iron absorption in the children who were taking iron supplements along with vitamin C supplements.

Rina Agustina, Ingeborg M.J. Bovee-O (2013) conducted a randomized, double-blind, placebo-controlled trial to assess the effectiveness of probiotics when added with cow milk to improve growth and iron status of Indonesian children .494 children between 1-6 years were randomly assigned to receive low- lactose milk with a low calcium content of 50 mg/dl to control group, a regular calcium content of 440 mg/dl, with 5×10^8 Lactobacillus casei for the experimental group. Growth, Anaemia and iron and zinc status were assessed before and after the intervention. The study results stated that ,with comparison to the randomized control group, the casei group had significantly greater weight gain of 0.03kg/month, and improvement in the iron status,

and the group independent from probiotics supplementation, regular milk calcium showed no affect on the growth or iron and zinc status.

Derman et al., (2012) done a Meta analysis study to investigate the absorption of non-haem iron in young females between 20-40 years. Females were provided with iron supplemented fruit based drinks containing two levels of Lactobacillus plantarum 299v (Lp299v). In the first study (n=10) the iron absorption from a fruit drink containing 10^9 cfu Lp299v was compared with a control drink without added bacteria while in the second study (n=11) the dose investigated was 10^{10} cfu Lp299v. The test and control drinks were labeled with ^{59}Fe (B) and ^{55}Fe (A) respectively, and consumed for breakfast on four consecutive days. The retention of ^{59}Fe was measured with whole-body counting and ^{55}Fe and ^{59}Fe were measured in the blood, 10 to 16 days after intake. Iron absorption from the fruit drink containing 10^9 cfu Lp299v was 28.6%, significantly higher than from the control drink (18.5%, p=0.028). The fruit drink with the higher amount of 10^{10} cfu Lp299v had an iron absorption of 29.1% while the control drink had an iron absorption of 20.1% ($p<0.08$). The amount of iron absorbed from the two drinks containing Lp299v did not differ significantly (p=0.941). The study findings concludes that there is iron absorption of 28.8%, significantly higher compared to the control drink (19.3%, p=0.004). The study findings stated that an intake of probiotic bacteria in the fruit fermented drink can increase the absorption of iron by50%.

Lena Hulthén (2010) conducted a randomised Control Study to assess the effectiveness of Probiotic on absorption of iron in child bearing potential. Women aged 19-45 years consumed meals with or without a capsule with freeze-dried lactobacillus planarum 9843. The absorption of iron from the meals was measured using stable iron isotopes. The study revealed that the absorption of iron from meals containing lactobacillus planarum 9843 was significantly higher than absorption from meals without probiotic bacteria

Sazawal S, et al., (2010) conducted a Double–blind, randomized, controlled community based trial on pre biotics and probiotics in young children among 624 children aged 1-4 years old in New Delhi were randomized to receive either control milk or fortified milk with an additional 1.9 x107 colony forming units of Bifid bacterium lactic HN019 and lacto bacillus acidophilus were the consumption of pre

biotic and probiotic fortified milk reduces the risk of being Anaemic and iron deficiency by 45 % and increased weight gain by 0.13 kg/ year when compared to controls. With respect to the role of probiotics in treating Anaemia study shows that children given an iron fortified fermented milk beverage had higher red blood cell measurements and was more likely improve haemoglobin levels with increased iron intake. This study provides evidence to support the use of both Lactobacillus acidophilus and Bifid bacterium lactis to prevent Anaemia in children.

Bering S, et al., (2006) conducted a study to test the effect of an oat gruel fermented with Lactobacillus plantarum 299v on non-haem Fe absorption from a low-Fe bioavailability meal compared with a pasteurised, fermented oat gruel and non-fermented oat gruels. Four groups of twenty-four healthy women with a mean age of 25 years were served with 4 different meals. The first group provided with fermented gruel, second group with pasteurised fermented gruel, third group with pH-adjusted non-fermented gruel, and fourth group with non-fermented gruel with added organic acids. The meals were extrinsically labelled with 55Fe or 59Fe and consumed on 4 consecutive days, Fe absorption was determined from isotope activities in blood samples. Results proved that The fermented gruel with live L. plantarum 299v increased Fe absorption significantly ($P < 0.0001$) compared with the pasteurised and non-fermented gruels thus Lactic acid-fermented foods have been shown to increase Fe absorption in human subjects, possibly by lowering pH, activation of phytases, and formation of soluble complexes of Fe and organic acids.

Stine Bering, Laila Sjøltov, Seema S. (2006) conducted a randomized, double-blinded crossover trial study to assess the effectiveness of heat-inactivated lactic acid-fermented oat gruel with and without added viable, lyophilized Lactobacillus plantarum 299v on non-haem Fe absorption. Eighteen healthy young women aged 22 years with low Fe status (serum ferritin, 30 mg/l) were served the two test gruels, extrinsically labelled with 59Fe and served with two enterocoated capsules (containing55Fe(II) and 55Fe(III), respectively) designed to disintegrate in the ileum. The meals were consumed on two consecutive days. Non-haem Fe absorption was determined from 59Fe whole-body retention and isotope activities in blood samples. The concentrations of Fe, lactate, phytate, and polyphenols, and the pH were differed in the heat-inactivated lactic acid-fermented oat gruels with and without added L. plantarum 299v, and a difference in

Fe absorption was observed between the test gruels. Absorption of Fe in the distal intestine was observed. Study results concluded that addition of viable, lyophilized lactobacillus to a heat-inactivated lactic acid-fermented oat gruel affect Fe absorption and absorption seems to occur in the distal part of the intestine from low Fe bioavailability meals in the healthy young women.

CHAPTER – 3

RESEARCH METHODOLOGY

This chapter describes the methodology to assess the effectiveness of probiotic supplementation on improvement of level of Anaemia among adolescent school girls studying at Tiruvannamalai. This study includes research design, setting, population, sample, and sample size, sampling technique, inclusive and exclusive criteria for selection of sample, development and description of tool, scoring procedure, content validity, pilot study, data collection procedure and plan for data analysis.

3.1 RESEARCH APPROACH

The Research Approach used in this study is Quantitative Research.

3.2 RESEARCH DESIGN

The Research Design is the researchers overall plan for obtaining answers to hypothesis.

The research design adopted for this study is pre test and post test design of Basic experimental design which comes under True experimental design. As the study fulfils the criteria such as manipulation, randomization, and control, the investigator rightly chose this design.

GROUP	PRE TEST	INTREVENTION	POST TEST
EXPERIMENTAL	RE 1	×	RE 2
CONTROL	RC 1	-	RC 2

Schematic representation of True experimental design

Where,

RE 1 - Pre test level of Anaemia in randomized experimental group.

RE 2 - Post test level of Anaemia in randomized experimental group.

× - Administration of probiotic supplementation.

RC 1 - Pretest level of Anaemia in randomized control group.

RC 2 - Post test level of Anaemia in randomized control group.

In this study, the pre assessment level of Anaemia of both experimental and control group were measured by using the cyanmethaemoglobin method followed by implementation of probiotic supplementation for 30 days for experimental group. At the end of 30th day, the post assessment level of Anaemia was obtained from the adolescent girls of experimental and control group by using the same cyanmethaemoglobin method.

3.3 VARIABLES

Independent Variable

Probiotic supplementation

Dependent Variable

Level of Anaemia

Extraneous Variable

Age, Type of family, No. of siblings, Religion, Monthly income of family, Educational status of father, Educational status of mother, Occupational status of father, Occupational status of mother, Type of diet, Habit of drinking tea, Area of residence, Menstrual duration, Source of information on Anaemia, Body Mass Index.

3.4 SETTING OF THE STUDY

The study was conducted at Municipal Girls Higher Secondary School, Tiruvannamalai, Tamilnadu. The Municipal Girls Higher Secondary School comprises of classes from 6th - 12th standard. The total strength of 11th and 12th standard students was 530.

3.5 POPULATION

The population comprises of adolescent Anaemic girls who are studying in Municipal Girls Higher Secondary School at Tiruvannamalai.

3.6 SAMPLE

Adolescent Anaemic girls, who fulfil the inclusive criteria.

3.7 SAMPLE SIZE

The sample size was 60 adolescent Anaemic girls, (30 in experimental and 30 in control group).

3.8 SAMPLING TECHNIQUE:

Sample refers to the subject of a population selected to participate in a research study. In this present study, the sample size consisted of 60 adolescent Anaemic girls studying at Municipal Girls Higher Secondary School, Tiruvannamalai. In this study, Simple Random Sampling Technique is used, in that lottery method is adopted to select the subjects who met the inclusive criteria.

There were pieces of paper that were written as E & C. The letter E was used to represent experimental group, and C was used to represent control group. Once the piece of paper was chosen, it was not included in the sample again and each participant was allowed to pick only once.

3.9 CRITERIA FOR SAMPLE SELECTION

The sample was collected based on the following criteria.

Inclusive Criteria

1. Adolescent Anaemic girls who are willing to participate
2. Adolescent Anaemic girls who were between 15-18 years.
3. Adolescent Anaemic girls who were taking iron supplementation provided by the School Health Services.
4. Adolescent Anaemic girls whose level of Anaemia is between 8-10.9 gm/dl

Exclusive Criteria

1. Adolescent anemic girls who haven't attained menarche.
2. Adolescent anemic girls who were not present during the period of data collection.
3. Adolescent girls underwent major surgery within six months.

3.10 DEVELOPMENT AND DESCRIPTION OF TOOL

Tool was developed from extensive review of literature, internet source and opinion of the experts. It was decided that bio physiological measure could be appropriate tool for the assessment of the level of Anaemia of adolescent girls.

The tool used for data collection has 2 sections.

Section A: Demographic variables

Section B: Description of intervention tool

Section A

This section consists of demographic data such as Age, Type of family, No. of siblings, Religion, Monthly income of family, Educational status of father, Educational status of mother, Occupational status of father, Occupational status of mother, Type of diet, Habit of drinking tea, Area of residence, Menstrual duration, Source of information on Anaemia, Body Mass Index.

Section B

The method used for estimation of haemoglobin is Cyanmethaemoglobin method, which is a type of calorimetric method, which was done with the help of a lab technician for the diagnosis of Anaemia. The blood sample was collected by needle prick method using sterile syringe, in a pre numbered test tube, for each adolescent girl. The first 2 drops were discarded on a glass slide, then 20 ul of blood was pipetted and transferred to a glass tube containing 5 ml of potassium ferricyanide and potassium cyanide (drab kin's reagent), the potassium ferricyanide oxidizes iron to form methaemoglobin, the potassium cyanide then combines with methaemoglobin to form cyanmethaemoglobin, and the Level of Anaemia estimation was done by using a photo electric calorie meter at a wave length of 540 nm.

Method of Scoring:

Anaemia is graded by WHO cut off scores,

Level	**WHO (Hb, g/dl)**
Level 0 (normal)	≥ 11
Level I (mild)	9.5-10.9
Level II (moderate)	8.0-9.4
Level III (Severe)	6.5-7.9
Level 1V (extremely severe)	<6.5

3.11 CONTENT VALIDITY

The content validity of the tool was established on the basis of opinion of two Medical experts; one Dietician and six Nursing experts specialized in Medical Surgical Nursing. Based on the suggestion of the experts, changes were made in the tool after consulting with the research guide.

3.12 ETHICAL CONSIDERATION

Ethics is a system of moral values that is concerned with the degree to which the research procedures adhere to the professional, legal and social obligations to the study participants.

(A) BENEFICIENCE

The investigator followed the fundamental ethical principle of beneficence (doing well) by adhering to

a) **The right to freedom from harm and discomfort**

The study will be beneficial for the participants as It reduces the level of Anaemia.

b) **The right to protection from exploitation**

The investigator explained the procedure and nature of the study to the participants and ensured that none of the participants in both experimental group and control group would be exploited or denied fair treatment.

(B) RESPECT FOR HUMAN DIGNITY

The investigator followed the second ethical principle of respect for human dignity. It includes the right to self-determination and the right to self -disclosure.

a) **The Right to Self-determination.**

The investigator gave full freedom to the participants to decide voluntarily whether to participate in the study or to withdraw from the study and the right to ask questions.

b) **The Right to Full Disclosure.**

The researcher has fully described the nature of the study, the person's right to refuse participation and the researcher's responsibilities

based on which both oral and written informed consent was obtained from the participants parents.

(C) JUSTICE

The researcher adhered to the third ethical principle of justice, it includes participant's right to fair treatment and right to privacy.

a) Right to Fair Treatment

The researcher selected the study participants based on the research requirements. The investigator followed the routine for control group.

b) Right to Privacy.

The researcher maintained the participant's privacy throughout the study.

(D) CONFIDENTIALITY

The researcher maintained confidentiality of the data provided by the study participants.

(E) INFORMED CONSENT

The researcher before stepping into the study, parental permission was obtained from the participants.

3.13 RELIABILITY

The reliability was established by inter-rater method to assess the internal consistency of the test. The reliability score was r=0.96.The reliability of the Cyanmethaemoglobin method was checked in two different laboratories to check the consistency of the test.

3.14: PILOT STUDY

Pilot study is a trial run for main study to test the reliability, appropriateness and feasibility of the study and the tool. Formal permission was sought from the Head of the Institution. Pilot study was conducted at Municipal Girls Higher Secondary School, Tiruvannamalai. A brief introduction about the self and study was given. Written consent was obtained from the parents and confidentiality of the response was assured. Blood tests were done for 15 adolescent girls. 6 adolescent girls who fulfilled the inclusive criteria were selected and divided 3 subjects in experimental and 3 subjects in control

group by lottery method. The data related to the demographic variables were collected and probiotics supplementation was administered for experimental group consequently for 7 days at 1.30 pm after lunch, whereas Control group was not given Probiotic supplementation. Both the groups were provided with the Iron and Folic acid supplementation issued by Government of Tamil Nadu every Thursday. Post test level of Anaemia was assessed in both the groups. The statistical analysis of the pilot study suggests that there is significant reduction in the level of anaemia at the level of $p<0.001$, hence the results of the pilot study revealed that the study was feasible, and probiotic supplementation has an effect in improving the level of anaemia, the subjects included in the pilot study were excluded in the main study.

3.15 PROCEDURE FOR DATA COLLECTION

Data collection is the gathering of information needed to address the research problem. The study was conducted at Municipal Girls Higher Secondary School, Tiruvannamalai. The data was collected for a period of 4 weeks in the month of June 2014. The National Iron Plus Initiative Guidelines Programme is issuing weekly supervised Iron and Folic acid supplements (400mg of elemental iron and 0.5µg of folic acid) for 52 weeks, every Thursday. Prior permission from the authorities was sought. The investigator gave brief information about the self and the purpose of the study to the subjects and confidentiality was assured. Parental consent was obtained and blood samples were collected from the adolescent girls and stored in pre- numbered test tubes. Haemoglobin was assessed using Cyanmethaemoglobin method and the Haemoglobin was graded using WHO Grading Scale for Anaemia. The subjects who fulfilled the inclusive criteria were selected by Simple Random Sample Technique. A total of 60 Anaemic adolescent girls were recruited in the study for experiment and control group, each group consists of 30 subjects. Data related to the demographic variables were collected.

The experimental group was administered with Probiotic supplementation at 1.30 pm after lunch for 30 days and they were taking Iron and folic acid (400mg of elemental iron and 0.5µg of folic acid.) supplements issued by Government of Tamil Nadu, whereas the control group received only iron and folic acid supplements without Probiotic supplementation. At the end of the 30^{th} day post test level of Anaemia

was measured using Cyanmethaemoglobin method, and graded using WHO Grading scale for Anaemia.

3.16 PLAN FOR DATA ANALYSIS

Both descriptive statistics and inferential statistics were used for data analysis.

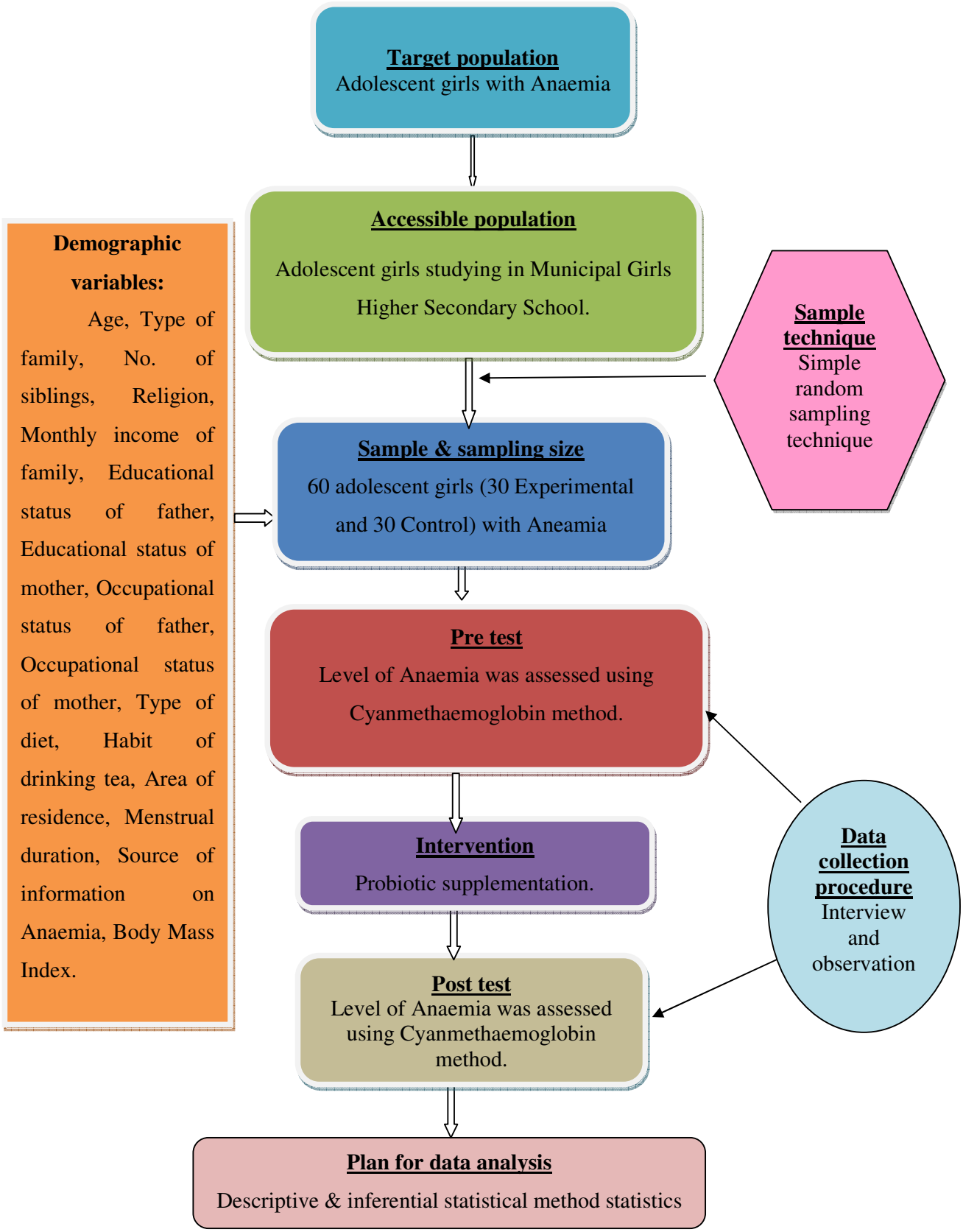
Descriptive Statistics

1. Frequency and percentage distribution was used to analyze the variables of adolescent girls in experimental and control group.
2. Mean and standard deviation was used to compute the level of Anaemia before and after the administration of probiotics among adolescent girls in experimental and control group.

Inferential Statistics

1. Paired ‘t’ test was used to compare the pre test and post test level of Anaemia within the experimental and control group.
2. Unpaired ‘t’ test was used to compare the pre test and post test level of Anaemia between experimental and control group.
3. ANOVA was used to find out the association of pre test and post test level of Anaemia with the selected demographic variables of experimental and control group.

SCHEMATIC REPRESENTATION OF RESEARCH DESIGN



CHAPTER – 4

DATA ANALYSIS AND INTERPRETATON

This chapter deals with the analysis and interpretation of data collected from 60 adolescent girls to assess the effectiveness of pro biotic supplementation on level of Anaemia among adolescent girls at Municipal Girls Higher Secondary School, Tiruvannamalai. Statistical analysis is a method for rendering quantitative information meaning full and intelligible. This enables the researcher to summarise, organize, evaluate and interpret and communicate information in numerical form.

The data collected for the study were grouped and analysed as per the objectives set for the study. Data analysis includes both descriptive and inferential statistics.

ORGANIZATION OF DATA

The data has been grouped, tabulated and organized below as follows:

Section 4.1: Demographic variables of adolescent girls in experimental and control group.

Section 4.2: Assessment of pre test and post test level of Anaemia among adolescent girls in experimental and control group.

Section 4.3: Comparison of pre test and post test level of Anaemia among adolescent girls in experimental and control group.

Section 4.4: Comparison of pre test and post test level of Anaemia among adolescent girls between experimental and control group.

Section 4.5: Association of pre and post mean difference level of Anaemia among adolescent girls with their selected demographic variables in experimental group.

Section 4.6: Association of pre and post mean difference level of Anaemia among adolescent girls with their selected demographic variables in control group.

SECTION 4.1: DESCRIPTION OF DEMOGRAPHIC VARIABLES OF ADOLESCENT GIRLS WITH ANAEMIA IN EXPERIMENTAL AND CONTROL GROUP

Table 4.1(a): Frequency and percentage distribution of demo graphic variables in respect to Age, Type of family, Educational status of father and Educational status of mother.

N=60

Demographic Variables	Experimental Group		Control Group	
	f	%	f	%
Age in years				
15 - 16 years	25	83.33	25	83.33
17 - 18 years	5	16.67	5	16.67
Type of family				
Nuclear	20	66.67	22	73.33
Joint	7	23.33	8	26.67
Extended	3	10.00	-	-
Educational status of father				
Non-literate	3	10.00	3	7.67
Primary & Middle school education	8	33.33	10	31.00
Up to Higher secondary education	7	21.00	6	17.67
Graduate and above	12	37.67	11	43.33
Educational status of mother				
Non-literate	12	40.00	10	33.33
Primary & Middle school education	7	23.10	8	26.67
Up to Higher secondary education	5	13.33	6	20.00
Graduate and above	6	16.67	6	17.00

Table 4.1(a) shows the frequency and percentage distribution of demo graphic variables in respect to age, type of family, educational status of father and educational status of mother.

In experimental group, with regard to the Age in years, majority of the subjects 25(83.33%) were between the age group of 15-16 years and 5(16.67%) were between 17-18 years of age.

In experimental group, with regard to the Type of family, majority of the subjects 20(66.67%) belongs to nuclear family, 7(23.33%) belongs to joint family, 3(10.00%) belongs to extended families.

In experimental group, with regard to the Educational status of father, 12(36.67%) were Graduate and above, 8(23.33%) had completed their Primary and Middle School Education, 7(20.00%) had completed their Higher Secondary Education, 3(10.0%) were non literate.

In experimental group, with regard to Educational status of mother, 12(40.00%) were non literate, 7(23.33%) had completed their Primary and Middle School Education, 5(16.67%) were Graduates and above, 4(13.33%) had completed their Higher Secondary Education.

In control group, with regard to the Age in years, majority of the subjects 25(83.33%) were between the age group of 15-16 years and 5(16.67%) were between the age group of 17-18 years.

In control group, with regard to the Type of family, majority of the subjects 22(73.33%) belongs to nuclear family, 8(26.67%) belongs to joint family.

In control group, with regard to Educational status of father, 11(43.33%) were Graduates and above, 10(31.00%) had completed their Primary and Middle School Education, 6(17.67%) had completed their Higher Secondary Education, 3(7.67%) were non literate.

In control group, with regard to Educational status of mother, 10(33.33%) were non literate, 8(26.67%) had completed their Primary and Middle School Education, 6(20.00%) had completed their Higher Secondary Education, 5(16.67%) were Graduates and above.

Table 4.1(b): Frequency and percentage distribution of demographic variables in respect to Occupational status of father, Occupational status of mother and Religion.

N=60

Demographic Variables	Experimental Group		Control Group	
	f	%	f	%
Occupational status of Father				
Unemployed	-	-	-	-
Unskilled worker	7	23.33	6	20.00
Skilled worker	6	17.67	5	16.67
Professional	14	44.33	10	33.33
Semi skilled	3	7.67	9	16.67
Occupational status of Mother				
Homemaker	17	56.67	21	70.00
Unskilled worker	5	16.67	2	6.67
Skilled worker	2	6.67	-	-
Professional	4	13.33	6	20.00
Semiskilled	2	6.67	1	3.33
Religion				
Hindu	20	66.67	21	70.00
Muslim	5	16.67	4	13.33
Christian	5	16.67	5	16.67
Others	-	-	-	-

Table 4.1(b) shows the frequency and percentage distribution of demographic variables in respect to Occupational status of father, Occupational status of mother and Religion.

In experimental group, with regard to the Occupational status of father, 14(44.33%) were Professional, 7(23.33%) were Unskilled workers, 6(17.67) were Skilled workers 3(7.67) were Semiskilled workers.

In experimental group, with regard to Occupational status of mother, 17(56.66) were Homemakers, 5(16.67%) were Unskilled workers, 4(13.33) were Professional, 2(6.67 %) were Skilled workers, 2(6.67 %) were Semiskilled workers.

In experimental group, with regard to the Religion, majority of the subjects 20(66.67 %) were Hindus, 5(16.67) were Muslim and 5(16.67 %) were Christians.

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In control group, with regard to Occupational status of father, 10(33.33%) were Professional, 9(16.67%) were Semiskilled worker, 6(20%) were Unskilled workers and 5(16.67%) were Skilled workers.

In control group, with regard to Occupational status of mother, majority of the subjects 21(70.00%) were Homemakers, 6(20.00 %) were Professional, 3(14.33%) were Unskilled workers.

In control group, with regard to Religion, majority of the subjects 21(70.00 %) were Hindus 5(16.67 %) were Christians and 4(13.33 %) were Muslims.

Table 4.1(c): Frequency and percentage distribution of demographic variables in respect to Type of diet, Monthly income of family, Source of information on anaemia and Menstrual duration.

N=60

Demographic Variables	Experimental Group		Control Group	
	f	%	f	%
Type of diet				
Vegetarian	15	50.00	17	56.67
Non-vegetarian	15	50.00	13	43.33
Monthly income of family				
Below Rs.5000	2	6.67	2	6.67
Rs.5001 to Rs.10000	11	36.67	12	40.00
Rs.10001 to Rs.15000	13	43.33	11	36.67
Rs.15001 to Rs.20000	4	13.33	5	16.67
Above Rs.20000	-	-	-	-
Source of information on anaemia				
Print media	8	26.67	8	26.67
Curriculum	6	20.00	8	26.67
Electronic media	7	23.33	4	13.33
Health personnel	4	13.33	4	13.33
Family members/Relatives/Friends	5	16.67	6	20.00
Menstrual duration				
<7 days	24	80.00	24	80.00
>7 days	6	20.00	6	20.00

Table 4.1(c) shows the frequency and percentage distribution of demographic variables with respect to Type of diet, Monthly income of family, Source of information on anaemia and Menstrual duration.

In experimental group, with regard to the Type of diet, half of the subjects 15(50.00%) were vegetarian and the remaining half of the subjects 15(50%) were non vegetarian.

In experimental group, with regard to Monthly income of family 13(43.33%) earns a Monthly income of Rs.10001 – 15000, 11(36.67%) earns a Monthly income of Rs.5001 – 10000, 4(13.33%) earns a Monthly income of Rs.15001 – 20000.and 2(6.67%) earns a Monthly income of < Rs 5000.

In experimental group, with regard to Source of information on anaemia, 8(26.67%) received information through print media 7(23.33%) received information through electronic media, 6(20%) received information through curriculum, 5(16.67%) received information through family members and relatives, and 4(13.33%) received information through health personnel.

In experimental group, with regard to Menstrual duration majority of the subjects 24(80%) has menstruation for <7 days and remaining 6(20%) has menstruation for >7 days.

In control group, with regard to the Type of diet, 17(56.67%) were vegetarian and 13(43.33 %) were non vegetarian.

In control group, with regard to Monthly income of family majority of the subjects 12(40%) had a monthly income of Rs.5001 – 10000, 11(36.67%) had a monthly income of Rs.10001 – 15000, 5(16.67%) had a monthly income of Rs.15001 – 20000 and 2(6.67%) had a monthly income of < 5000.

In control group, with regard to Source of information on anaemia, 8(26.67%) received information through print media, 8 (26.67%) received through curriculum, 4(13.33%) received information through electronic media, 4(13.33%) received information through health personnel and 6(20%) received information through family members and relatives.

In control group, with regard to Menstrual duration majority of the subjects 24(80%) has menstruation for < 7 days and remaining 6(20%) has menstruation for >7 days.

Table 4.1(d): Frequency and percentage distribution of demographic variables in respect to BMI, Habit of drinking tea, No. of siblings, Area of residence.

N=60

Demographic Variables	Experimental Group		Control Group	
	f	%	F	%
BMI				
<18.5	13	43.33	26	86.67
18.6 - 24.99	13	43.33	2	6.67
25 - 29.99	4	13.33	2	6.67
>30	-	-	-	-
Habit of drinking tea				
Yes	7	23.33	4	13.33
No	23	76.67	26	86.67
No. of siblings				
<2 children	11	36.67	7	23.33
>3 children	19	63.33	23	76.67
Area of residence				
Rural	24	80.00	25	83.33
Urban	6	20.00	5	16.67

Table 4.1(d) shows the Frequency and percentage distribution of demographic variables in respect to BMI, Habit of drinking tea, No. of siblings, Area of residence.

In experimental group, with regard to Body Mass Index, 13(43.33%) had BMI of <18.5, 13(43.33%) had BMI 18.6 - 24.99 and 4(13.33%) had BMI 25 – 29.99.

In experimental group, with regard to Habit of drinking tea, 7(23.33%) has the habit of drinking tea, 23(76.67%) doesn't have the habit of drinking tea.

In experimental group, with regard to Number of siblings, 11(36.57%) had < 2 children and 19(63.33 %) has > 3 children.

In experimental group, with regard to the Area of residence, majority of the subjects 24(80%) were residing in rural area and 6(20%) were residing in urban areas.

In control group, with regard to Body Mass Index, majority of the subjects 26(86.87%) were <18.5 of BMI, 2(6.67%) had BMI 18.6 - 24.99 and 2(6.67%) had BMI 25 – 29.99.

In control group, with regard to Habit of drinking tea, 4(13.33%) has the Habit of drinking tea, 26(86.67%) doesn't have the Habit of drinking tea.

In control group, with regard to Number of siblings, 7(23.33%) has < 2 children and 23(76.76%) has > 3 children.

In control group, with regard to the Area of residence, majority of the subjects 25(83.33%) were residing in rural area and 5(16.67%) were residing in urban area.

SECTION 4.2: ASSESSMENT OF PRE TEST AND POST TEST LEVEL OF ANAEMIA AMONG ADOLESCENT GIRLS IN EXPERIMENTAL AND CONTROL GROUP.

N = 60

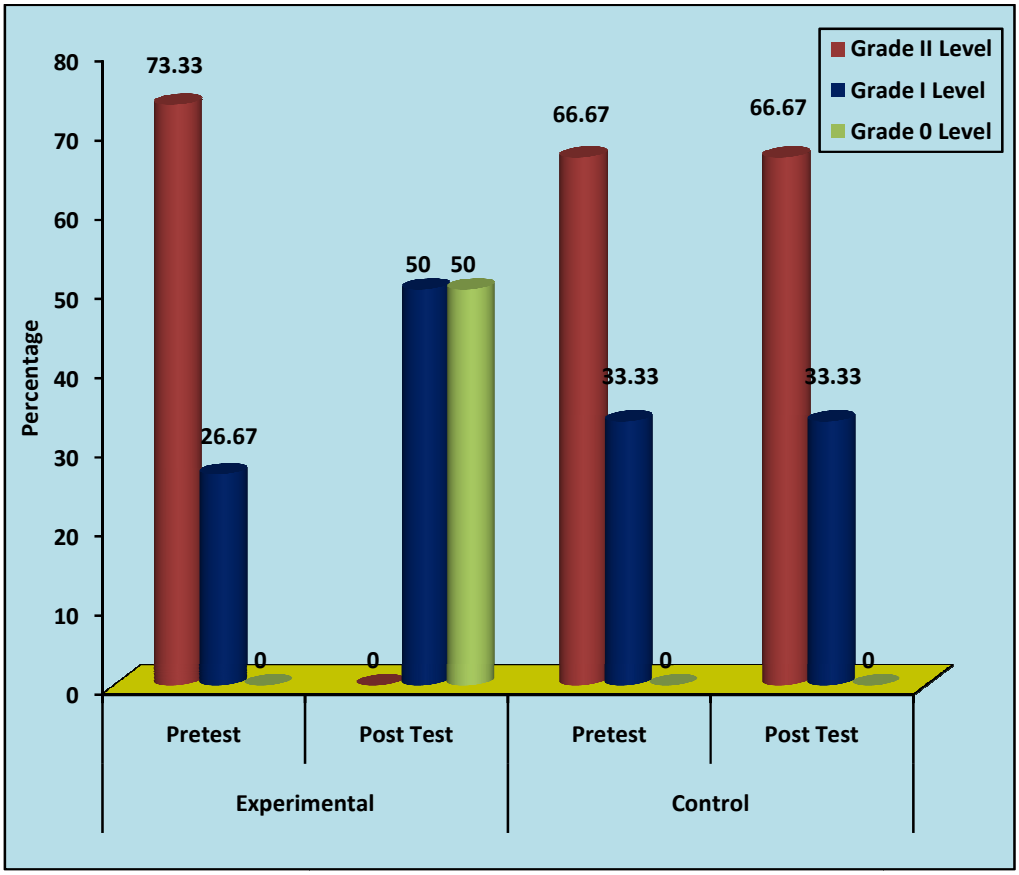

Figure 4.2.1: Percentage distribution of pre test and post test level of anaemia in experimental and control group

Figure 4.2.1 shows that, in experimental group, majority 22(73.33%) had grade II level of Anaemia and the remaining 8(26.67%) had grade I level of Anaemia in the Pretest. Whereas in the Post test experimental group, after the implementation of Probiotic supplementation 15(50%) had grade I level of Anaemia and 15(50%) had grade 0 level of Anaemia.

In Pre test control group, majority 20(66.67%) had grade II level of Anaemia and the remaining 10(33.33%) had grade I level of Anaemia, whereas in Post test control group, without the administration of Probiotic supplementation, majority 20(66.67%) had grade II level of Anaemia and the remaining 10 (33.33%) had grade I level of Anaemia.

SECTION 4.3: COMPARISON OF PRE TEST AND POST TEST LEVEL OF ANAEMIA AMONG ADOLESCENT GIRLS IN EXPERIMENTAL GROUP AND CONTROL GROUP

Table 4.3.1: Comparison of pre test and post test level of Anaemia among adolescent girls in experimental and control group.

N=60

S.No.	Group	Assessment	Mean	S.D	Paired 't' Value
1	Experimental	Pretest	8.79	0.66	t = 12.717***
		Post Test	11.01	0.95	p = 0.000, S
2	Control	Pretest	8.96	0.72	t = 2.591*
		Post Test	9.25	0.52	p = 0.05, S

*p<0.05, ***p<0.001, S – Significant

The table 4.3.1 shows that ,In experimental group, the pre test mean score of Anaemia was 8.79 with S.D 0.66 and the post test mean score of Anaemia was 11.01 with S.D 0.95, and the calculated paired 't' value t = 12.717was found to be statistically significant at p<0.001 level. This clearly shows that the implementation of Probiotic supplementation had shown a significant improvement in the post test level of anaemia among adolescent girls in the experimental group than the adolescent girls in the control group.

In control group, the pre test mean score of Anaemia was 8.96 with S.D 0.72 and the post test mean score of Anaemia was 9.25 with S.D 0.25, and the calculated paired 't' value t = 2.591was found to be statistically significant at p<0.05 level. This clearly shows that the adolescent girls who were taking iron and folic acid supplements had shown significant improvement.

This clearly shows that administration of Probiotic supplementation had shown a significant improvement their post test level of anaemia than the adolescent girls in the control group.

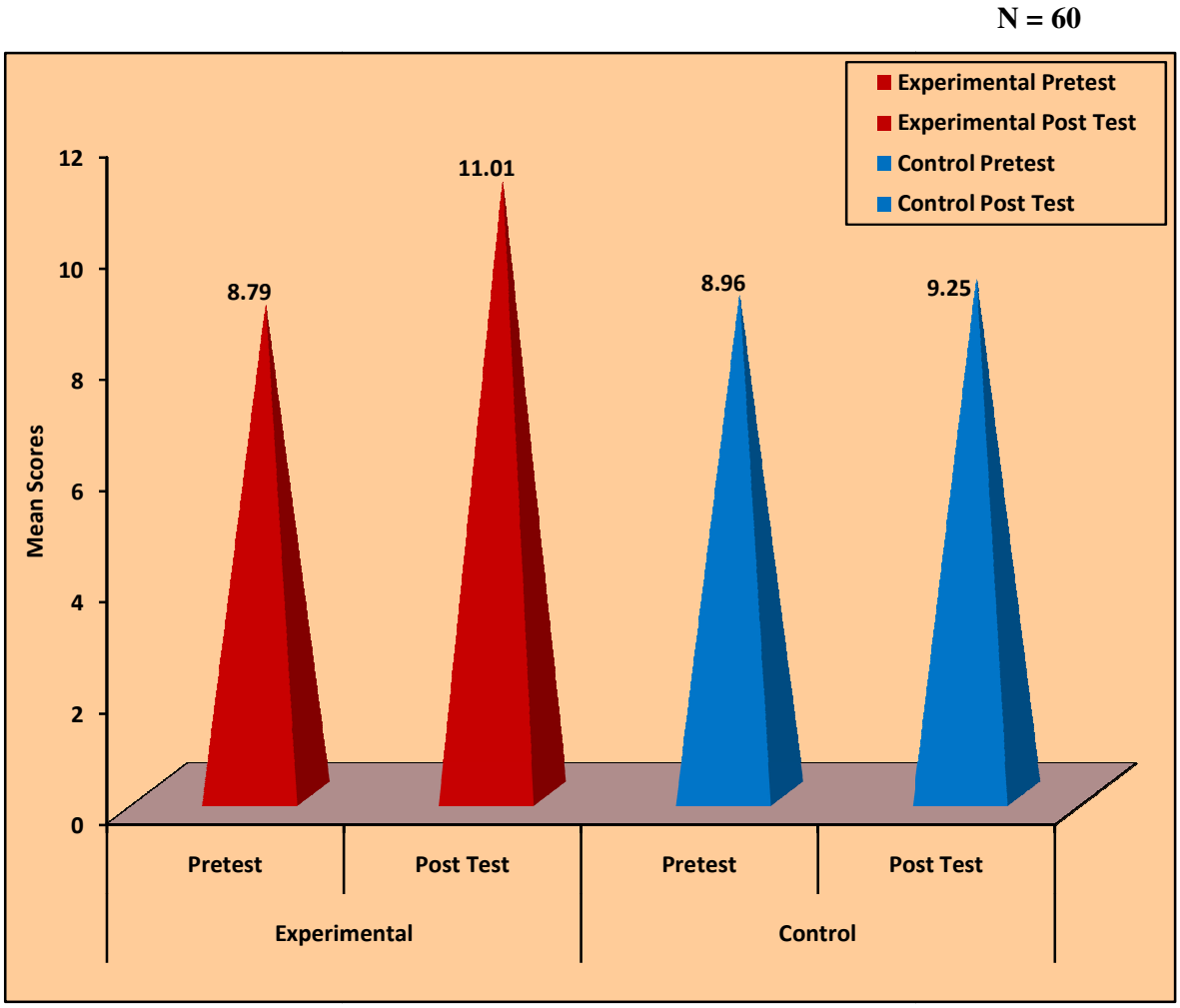

Fig.4.3.1: Comparison of pre test and post test level of anaemia among adolescent girls in experimental and control group

SECTION 4.4: COMPARISON OF PRETEST AND POST TEST LEVEL OF ANAEMIA AMONG ADOLESCENT GIRLS BETWEEN THE EXPERIMENTAL AND CONTROL GROUP.

Table 4.4.1: Comparison of pre test and post test level of Anaemia among adolescent girls between the experimental and control group.

N=60

S.No.	Assessment	Group	Mean	S.D	Unpaired 't' Value
1	Pretest	Experimental	8.79	0.66	t = -0.911
		Control	8.96	0.72	p = 0.366, N.S
2	Post Test	Experimental	11.01	0.95	t = 8.872
		Control	9.25	0.52	p = 0.000, S***

***p<0.001, S – Significant, N.S – Not Significant

Table 4.4.1 shows that, the pre test mean score of Anaemia in the experimental group was 8.79 with standard deviation 0.66 and the pre test mean score of Anaemia in the control group was 8.96 with the standard deviation was 0.72. The calculated unpaired 't' value of t=-0.911 was not found to be statistically significant which indicates that there was no difference in the pre test level of anaemia between the groups.

The post test mean score of Anaemia in the experimental group was 11.01 with standard deviation 0.95 and the post test mean score of Anaemia in the control group was 9.25 with the standard deviation was 0.52 . The calculated unpaired 't' value of t=8.872 was found to be statistically significant at p<0.001which indicates that there was difference in the post test level of Anaemia between the groups, this clearly shows that the administration of Probiotic supplementation reduces the level of Anaemia in the experimental group.

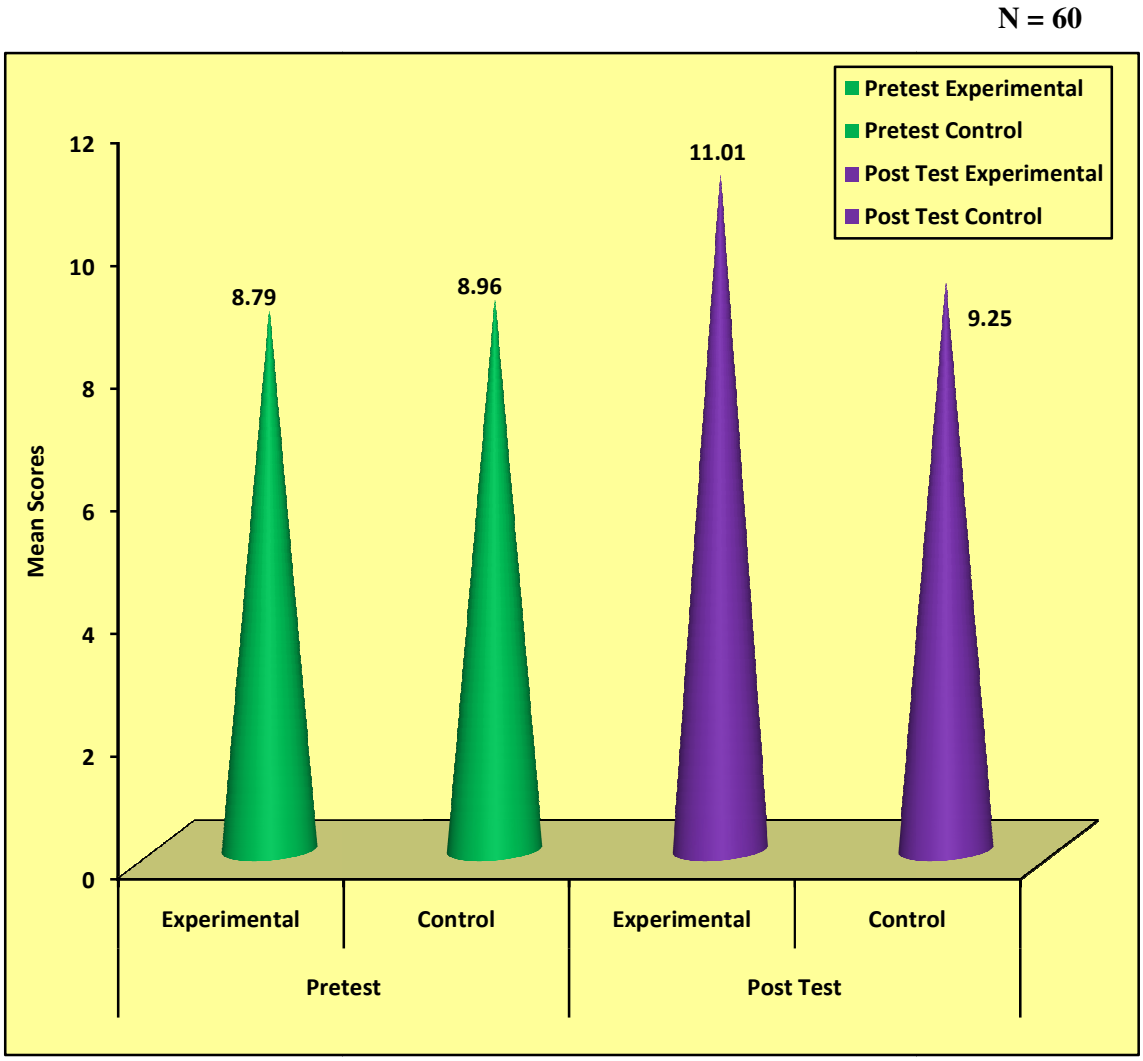

Figure 4.4.1: Comparison of pre test and post test level of anaemia among adolescent girls between the experimental and control group.

SECTION 4.5: ASSOCIATION OF PRE TEST AND POST TEST MEAN DIFFERENCE LEVEL OF ANAEMIA AMONG ADOLESCENT GIRLS WITH THEIR SELECTED DEMOGRAPHIC VARIABLES IN THE EXPERIMENTAL GROUP.

Table 4.5.1: The association of pre test and post test mean difference level of Anaemia among adolescent girls with their selected demographic variables in the experimental group.

n=30

S.No.	Demographic Variables	Pretest		Post Test		Mean Imp.		ANOVA/ Unpaired 't' Value
		Mean	S.D	Mean	S.D	Mean	S.D	
1	**Mother's Occupation**							
	Homemaker	9.01	0.68	10.87	0.67	1.86	0.60	F = 3.248 p = 0.028 S*
	Unskilled worker	8.41	0.53	10.93	1.25	2.51	1.15	
	Skilled worker	-	-	-	-	-	-	
	Professional	8.37	0.20	11.82	1.28	3.45	1.24	
	Semi skilled	8.80	1.13	10.65	1.62	1.85	0.49	
2	**Monthly income of Family**							
	Below Rs.5000	8.30	0.42	11.80	2.26	3.50	1.83	F = 4.477 p = 0.012 S*
	Rs.5001 to Rs.10000	8.61	0.67	10.55	0.67	1.93	0.44	
	Rs.10001 to Rs.15000	9.08	0.67	11.03	0.66	1.94	0.70	
	Rs.15001 to Rs.20000	8.60	0.37	11.80	1.29	3.20	1.42	
	Above Rs.20000	-	-	-	-	-	-	

*P<0.05, S-Significant

Table 4.5.1 shows the association of pre test and post test mean difference level of anaemia among adolescent girls with their selected demographic variables in the experimental group.

It was evident from the above table that there was a statistical significant association of pre test and post test mean difference level of anaemia with Occupational status of mother and Monthly income of family at p<0.05 level and there was no statistical significant association with other demographic variables in the experimental group.

SECTION 4.6: ASSOCIATION OF PRE TEST AND POST TEST MEAN DIFFERENCE LEVEL OF ANAEMIA AMONG ADOLESCENT GIRLS WITH THEIR SELECTED DEMOGRAPHIC VARIABLES IN THE CONTROL GROUP.

Table 4.6.1: Association of pre test and post test mean difference level of anaemia among adolescent girls with their selected demographic variables in the control group.

n=30

S.No.	Demographic Variables	Pretest		Post Test		Mean Imp.		ANOVA/ Unpaired 't' Value
		Mean	S.D	Mean	S.D	Mean	S.D	
1	**Occupational status of Father**							
	Unemployed	-	-	-	-	-	-	F = 0.653 p = 0.630 N.S
	Unskilled worker	8.90	0.74	9.80	0.37	1.06	0.29	
	Skilled worker	8.80	0.77	9.82	0.87	0.96	0.41	
	Professional	9.05	0.70	9.80	0.64	0.95	0.24	
	Semi Skilled	9.28	0.83	9.86	0.68	1.28	0.21	
2	**Monthly income of family**							
	Below Rs.5000	8.70	0.98	10.05	0.92	1.40	0.14	F=0.208 P=0.890 N.S
	Rs.5001 to Rs.10000	8.83	0.73	9.69	0.55	1.05	0.29	
	Rs.10001 to Rs.15000	8.95	0.69	9.78	0.70	0.96	0.34	
	Rs.15001 to Rs.20000	9.38	0.75	9.90	0.68	1.14	0.18	
	Above Rs.20000	-	-	-	-	-	-	

N.S – Not Significant

Table 4.6.1 shows the association of pre test and post test mean difference level of anaemia among adolescent girls with their selected demographic variables in the control group**.**

It was evident from the above table that there was no statistical significant association of pre test and post test mean difference level of anaemia with demographic variables at $p < 0.05$ in control group.

CHAPTER – 5

DISCUSSION

The study was conducted to evaluate the effectiveness of Probiotic supplementation on level of Anaemia among adolescent girls.

The discussion is based on the objectives, review of literature and null hypothesis specified in this study.

5.1 The First objective was to assess the pre test level of Anaemia among the adolescent girls in experimental and control group.

The analysis on pre test level of Anaemia in experimental group revealed that 22 (73.33%) of subjects had grade II level of Anaemia and 8 (26.67%) subjects had grade I level of Anaemia.

The analysis on pre test level of Anaemia in control group revealed that 20 (66.67%) subjects had grade II level of Anaemia and 10 (33.33%) subjects had grade I level of Anaemia.

5.2 The Second objective was to assess the post test level of Anaemia among the adolescent girls in experimental and control group.

The analysis on post test level of Anaemia in experimental group revealed that 15(50.00%) subjects had grade I level of Anaemia and 15(50.00%) subjects had grade 0 level of Anaemia.

The analysis on post test level of Anaemia in control group, revealed that 20(66.67%) subjects had grade II level of Anaemia and 10(70.00%) subjects had grade I level of Anaemia.

The study findings was consistent with the study conducted by **Gandham Bulliya (2007)** to assess the prevalence of Anaemia among non school going adolescent girls and to find out the association between haemoglobin concentration, socio economic and nutritional factors between the ages of 11-19 years, for about 1937 subjects, informed consent was obtained from the parents and the adolescent girls were

interviewed and anthropometric measurements were collected, haemoglobin estimation was carried by cyanmethaemoglobin method, Anaemia and nutritional status was evaluated according to standard procedures, the results has shown that of the total adolescent girls, 96.5% were Anaemic, of which 45.2% had mild Anaemia,46.95% had moderate Anaemia, 4.4% had severe Anaemia.

5.3 The third objective was to compare the pre and post test level of Anaemia among adolescent girls in experimental group.

In experimental group the analysis on pre test mean value and standard deviation on level of Anaemia was 8.79 and 0.66 and post test mean value and standard deviation on level of Anaemia was 11.01 and 0.95. The calculated paired 't' value 12.717 was highly significant at $p<0.001$. This clearly shows that the implementation of Probiotic supplementation had shown a significant improvement in the post test level of Anaemia among adolescent girls than the adolescent girls in the control group hence the null hypothesis NH_1 which was stated earlier that "**there is no significant difference between the pre test and post test level of Anaemia among the adolescent girls in experimental group at $p<0.05$"** was rejected.

5.4 The fourth objective was to compare the pre and post test level of Anaemia among adolescent girls in control group.

In control group the analysis on pre test mean value and standard deviation on the level of Anaemia was 8.79 and 0.66. The post test mean value and standard deviation on the level of Anaemia was 9.25 and 0.52. The calculated paired 't' value was significant at $p<0.05$ level. This clearly shows that the adolescent girls, who were taking iron and folic acid supplements shown a significant improvement. Hence the null hypothesis NH_2 stated earlier **"there is no significant difference between the pre test and post test level of Anaemia among the adolescent girls in control group at $p<0.05$"** was rejected.

5.5 The fifth objective was to compare the pre test level of Anaemia among adolescent girls between experimental and control group

In analysis on the pre test mean value and standard deviation on level of Anaemia in experimental group was 8.79 and 0.66. The pre test mean value and standard deviation on the level of Anaemia in control group was 8.96 and 0.72. The calculated unpaired 't' value 0.911 was not significant at $p<0.001$ level.

5.6 The sixth objective was to compare the post test level of Anaemia among adolescent girls between experimental and control group

In analysis on the post test mean value and standard deviation on level of Anaemia in experimental group was 11.01 and 0.95. The post test mean value and standard deviation on the level of Anaemia in control group was 9.25 and 0.52. The calculated unpaired 't' value 8.872 was significant at $p<0.001$ level, which indicates that there was difference in the post test level of Anaemia between the groups, this clearly shows that the administration of Probiotic supplementation reduces the level of Anaemia in the experimental group. Hence, the null hypothesis NH_3 which was stated that **"there is no significant difference in the post test level of Anaemia among the adolescent girls between experimental and control group at $p < 0.05$"** was rejected.

5.7 The seventh objective was to determine the association in the pre and post test mean difference level of Anaemia in the experimental group.

There is a statistical significant association on the level of Anaemia with occupational status and monthly income of family at $p <0.05$, and there is no statistical significance association with other demographic variables in experimental group. Hence the Null hypothesis NH_4 which was stated earlier that **"there is no significant association in the pre and post test mean difference level of Anaemia among Adolescent girls with their selected demographic variables in experimental group at $p <0.05$"** was rejected.

5.8 The eighth objective was to determine the association in the pre and post test mean difference level of Anaemia in the control group.

There is no statistical significant association of level of Anaemia with all demographic variables like Age, Type of family, Educational status of father, Educational status of mother, Occupational status of father, Occupational status of mother, Religion, Type of diet, Source of information of Anaemia, Menstrual duration, Habit of drinking tea, Area of residence, No. of siblings, Body Mass Index, Monthly income of family at $p<0.05$ level. Hence the null hypothesis NH_5 which was stated earlier that **"there is no significant association of pre test and post test mean difference level of Anaemia among adolescent girls with their selected demographic variables in control group at $p <0.05$"** was retained.

CHAPTER – 6

SUMMARY, CONCLUSION, IMPLICATIONS, RECOMMENDATIONS AND LIMITATIONS

This chapter deals with the summary of the study, conclusion drawn, implication, recommendations and limitations of the study.

SUMMARY

This study was undertaken to determine the effectiveness of probiotic supplementation on level of Anaemia among adolescent girls studying at selected school in Tiruvannamalai district.

Anaemia is a major public health problem worldwide and is often ignored in both developed and developing countries. Preschool children, pregnant women and adolescents constitute vulnerable group of Anaemia. According to **World Health Organization (2001),** 4-5 billion people (66-80%) of the world's population, may be iron deficient. Among 2 billion people over 30% of the world's population are Anaemic, mainly due to iron deficiency. In total, 800,000 (1.5 percent) of deaths worldwide are attributable to iron deficiency. Adolescence is a period of transition between child hood & adult hood, which begins from the age of 10 years to 19 years, that is the second decade of life. They remain a largely neglected, difficult-to-measure, and hard-to-reach population, in which, the needs of adolescent girls are often ignored. This area of adolescent health has been difficult to study, as there are many unknown factors and consequences for Iron Deficiency in terms of standards, measurement indicators and health consequences. Iron requirements peak during adolescence due to rapid growth and increase in blood volume, though this vulnerable period has been focused by existing programmes it has to be constantly enhanced to offset the added burden like menstrual blood loss which precipitates the crisis often. In developing countries parasitic infections and other infectious diseases are more common which peak the requirements of iron in the human body, moreover Iron Deficiency may be caused by poor iron containing diet, body not being able to absorb iron very well, even though consumption of iron is normal. This study highlights the significance of Probiotic supplementation in enhancing the absorption of iron in adolescent girls. It will also be helpful in drawing

recommendations and rendering suggestions to evaluate and enhance the existing Anaemia Control Programmes.

Since iron absorption is the most important aspect in Iron Deficiency Anaemia, here comes the term probiotics, refers to foods or supplements containing live beneficial microbes, primarily bacterial strains, that are used to fortify or rebuild natural gut flora. This is traditionally done by the consumption of probiotics, live microbial food supplements. Prebiotics have the ability to support the growth of probiotics. The fermentation of Probiotics by colonic bacteria gives rise to production of unbranched SCFA such as acetic, propionic, butyric, and lactic acids, thereby lowering intestinal pH, inhibiting the growth of potentially harmful bacteria and improving mineral and iron absorption.

The objectives of the study were:

1. To assess the pre test level of Anaemia among adolescents girls in experimental and control group.
2. To assess the post test level of Anaemia among adolescents girls in experimental and control group.
3. To compare the pre and post test level of Anaemia among adolescents girls in experimental group.
4. To compare the pre and post test level of Anaemia among adolescent girls in control group.
5. To compare the pre test level of Anaemia among adolescent girls between experimental and control group.
6. To compare the post test level of Anaemia among adolescent girls between experimental and control group.
7. To associate the mean difference in pre and post test level of level of Anaemia among adolescent girls with their selected demographic variables in experimental group.
8. To associate the mean difference in pre and post test level of level of Anaemia among adolescent girls with their selected demographic variables in control group.

The null hypotheses stated were:

NH_1- There is no significant difference between the pre test and post test level of Anaemia among the adolescent girls in experimental group at $p<0.05$.

NH_2- There is no significant difference between the pre test and post test level of Anaemia among adolescent girls in control group at $p<0.05$.

NH_3- There is no significant difference in the post test level of Anaemia among adolescent girls between experimental and control group at $p<0.05$.

NH_4- There is no significant association in the pre and post test mean difference level of Anaemia among adolescent girls with their selected demographic variables in experimental group at $p<0.05$.

NH_5- There is no significant association in the pre and post test mean difference level of Anaemia among adolescent girls with their selected demographic variables in control group at $p<0.05$.

The assumptions were:

1. Adolescent girls may have Iron Deficiency Anaemia.
2. Probiotic supplementation may increase the iron absorption which increases the blood haemoglobin level.

The conceptual framework for this study was developed based on the Imogene Kings Goal Attainment Theory. This provide comprehensive framework for perception, judgement, action, reaction, interaction, transaction, feedback and re assessment.

The research design selected for this study was True experimental design. Pre test and post test design was used and the study was conducted in Municipal Girls Higher Secondary School, Tiruvannamalai. The tool used for data collection consisting of demographic variables such as Age, Type of family, No. of siblings, Religion, Monthly income of family, Educational status of father, Educational status of mother, Occupational status of father, Occupational status of mother, Type of diet, Habit of drinking tea, Area of residence, Menstrual duration, Source of information on Anaemia, Body Mass Index. Cyanmethaemoglobin method was used to assess the level of Anaemia among adolescent girls.

The pilot study was conducted in Municipal Girls Higher Secondary School, Tiruvannamalai, and the findings revealed that the tool was feasible, reliable and practicable to conduct the main study.

The content validity of the tool was established by 8 experts consisting of 2 Medical experts and 6 Nursing experts and the reliability of the tool was confirmed by inter-rater reliability method r=0.96. So the tool was highly reliable.

The main study was conducted in Municipal Girls Higher Secondary School, Tiruvannamalai. Based on the inclusive criteria, the investigator selected 60 subjects from the school, from that 30 subjects were selected for experimental group and 30 subjects were selected for control group through lottery method

The pre test level of Anaemia was assessed using cyanmethaemoglobin method, subjects of the experimental group were provided with probiotic supplementation, and that of control group was not administered with probiotic supplementation. Both the groups were on routine School Health Services. The post test level of Anaemia was assessed by using the same cyanmethaemoglobin method. Data pertaining to the demographic variables were collected by the investigator by interview method. Both inferential and descriptive statistics were used to analyze the data.

The major findings of the study were:

In comparison of the pre test and post test level of Anaemia among adolescent girls in experimental group, revealed that the calculated paired 't' value $t = 12.717$ was found to be statistically significant at $p<0.001$ level. This clearly shows that the implementation of Probiotic supplementation had shown a significant reduction in the post test level of Anaemia among adolescent girls in the experimental group.

In comparison of post test level of Anaemia among adolescent girls between the experimental and control group revealed that the calculated unpaired 't' value of $t=8.872$ was found to be statistically significant at $p<0.001$, which indicates that there was difference in the post test level of Anaemia between the groups, this clearly shows that the administration of Probiotic supplementation had reduced the level of Anaemia in the experimental group.

The data was collected and analyzed by using descriptive and inferential statistics. The findings revealed that there was high significant difference in the level of Anaemia among adolescent girls after the administration of probiotic supplementation.

The majority of the subjects before administering probiotic supplementation were on grade II and grade I level of Anaemia whereas after receiving probiotic supplementation 50% of adolescent girls were on grade 0 level of Anaemia.

CONCLUSION

The present study assessed the effectiveness of pro biotic supplementation on the level of Anaemia among adolescent girls at selected school, Tiruvannamalai. The study findings concluded that there was a statistically significant difference in the level of Anaemia after the administration of Probiotic supplementation and this proved to be an effective method to reduce the level of Anaemia among the adolescent girls.

IMPLICATIONS

The investigator has drawn the following implications from the study which is of vital concern to the field of Nursing Practice, Nursing Education, Nursing Administration and Nursing Research.

Nursing Practice

1. The Nursing personnel, should develop an in depth knowledge about Anaemia and its ill effects in the adolescent girls and dietary supplementation which enhance iron absorption.
2. Conduct Health talks about Probiotic supplementation in enhancing the iron absorption.
3. Initiate the Government to recruit the School Health Nurses in taking care of Anaemia among adolescent girls.
4. Guide the schools in arranging and conducting Teacher Parents meeting to be conducted in schools regarding the health conditions of the Anaemic adolescent girls.
5. The Nursing personnel should conduct Mass Educational Programmes on health benefits of probiotics.

6. The Nursing personnel should possess professional responsibilities in educating the adolescent girls that encompasses teaching, demonstration, counseling about dietary modification and intake of fermented foods.
7. Utilize the findings of the study to plan regular and periodic health education sessions for adolescent Anaemic girls in schools and in community health centre regarding Iron Deficiency Anaemia.

Therefore the Nursing Practice should include the probiotic supplementation as a part of dietary intake for enhancing the absorption of iron, which can be included in the nursing care.

Nursing Education

1. Nurse educator need to educate the students about the signs and symptoms of Anaemia, diets which enhance and inhibit the absorption of iron and the deterioration effects of Anaemia on students level of intellectual ability, poor academic performance and future risks in pregnancy.
2. Curriculum should be strengthened for nurses to excel them in knowledge and skill in areas of dietary supplementation, which enhances the iron absorption.
3. Nurse educator can arrange and conduct workshops, conferences, seminars, puppet shows, and health talks to the students and staffs, regarding use of probiotic supplementation in day to day life.
4. Initiate preparation of probiotic literature related to iron absorption for students reference, encourage budding nurses to bring out innovative and creative ideas pertaining to preparation of AV aids for Mass Public Education and can encourage students for effective utilization of research based practice in adolescent Anaemic girls.

Nursing Administration

1. Nurse administrator can collaborate with Governing bodies in regulating policies and fund them to provide probiotic supplementation for the adolescent school children ,issuing iron supplements and screening their haemoglobin values, maintenance of School health records and Supervision of students

academic performance and arrange for parents teacher meeting, educational programmes on the ill effects of Anaemia .

2. Arrange for public awareness programmes in schools and communities and provide opportunity for all community health workers, parents, adolescent girls to participate in health education regarding Anaemia and its risks, and the importance of intake of iron rich foods, food fads ,inhibitors and absorption of iron, prevention of worm infestation.
3. Plan and Conduct in-service education programmes in effectiveness of intake of naturally fermented foods like probiotics.
4. Conduct Continuing Nurse Education programmes based on Iron Deficiency Anaemia.
5. Incorporate the findings of the study to plan training programmes for health personnel to create awareness regarding Probiotic supplemented foods.
6. Nurse administrator collaborates with governing bodies to create policies and mobilizing resources, create coalition with Non Governmental Organisation, in order to create awareness regarding Iron Deficiency Anaemia among adolescent girls.

Nursing Research

1. As a Nurse Researcher, disseminate the findings through the conferences, seminars, publications in professional national and international journals and World Wide Web.
2. Promote more researches on probiotics other health benefits.
3. The research report can be used as a review material for further studies.
4. As a nurse researcher, encourage the utilization of Evidence Based Practice in the clinical and community setting.
5. The research study expedites the gravity of the problem, which invites attention to the need for further studies in related areas.

RECOMMENDATIONS

Research is a never ending process of acquiring knowledge that yields a result on its completion. Recruiting School Health Nurses and assessing the level of Anaemia which may act as a stepping stone.

THE STUDY RECOMMENDS THE FOLLOWING FOR THE FUTURE RESEARCH

1. The study can be conducted with larger population in a different setting for better generalization
2. A Comparative study can be done to assess the effectiveness of Probiotic supplementation on level of Anaemia among different age groups.
3. A Study can be conducted to assess the effectiveness of other sources of Probiotic in improvement in haemoglobin status.
4. A study can be conducted to assess the knowledge, attitude and practice of Probiotic supplementation among the adolescent Anaemic girls.
5. A Study to assess the effect of Probiotic supplementation among the hospitalized Anaemic patients.
6. A Study to assess the effects of Probiotic supplementation on level of Anaemia among adolescent girls who are not taking iron supplements.
7. A study to assess the effectiveness of Structured Teaching Programme regarding dietary management in the form of fermented foods, food fortification, for prevention and control of Anaemia.

LIMITATIONS

1. As there were limited studies on probiotic supplementation on level of Anaemia, the investigator had difficulty in obtaining related reviews of literature.
2. The sample size was only 60, hence the findings could not be generalized.

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Affiliated to The Tamil Nadu Dr.M.G.R. Medical University, Chennai

LETTER SEEKING AND GRANTING PERMISSION FOR DATA COLLECTION

Date: 05.05.2014

To

The Principal,
Municipality Girls Higher Secondary School,
Tiruvannamalai.

Madam,

Sub: Requesting to grant permission for data collection– Regarding.

******

Mrs. R.Raj Thanga Rekha is a bonafide student of our college studying in M.Sc (Nursing) programme. As a partial fulfillment of the University requirement for the award of M.Sc (Nursing) degree, she needs to conduct research project.

Her chosen research project is as follows "A Study to assess the Effectiveness of Probiotic supplementation on level of anemia among Adolescent girls studying in selected school, Tiruvannamalai" during May-June 2014 .

She will abide by the rules and regulations of the institution and adhere to the institutional policies during her period of data collection. Permission may kindly be granted to her for conduction of the study at your esteemed institution.

Further details of the proposal project will be furnished by the student personally. Confidentiality will be ensured in the research project.

Thanking you

Yours faithfully,

PRINCIPAL,
Vignesh Nursing College,
Kizhanaikkarai,
Tiruvannamalai - 606 603

Phone : 04175 - 235410
Fax : 04175 - 235410
E-mail : vnc_tvmalai@yahoo.co.in
Website : www.vigneshgroupofcolleges.com

To

The Principal,

Vignesh Nursing College,

Tiruvannamalai.

Madam,

Sub: permission for conducting study- Reg.

Ref: your letter dated 05.05.2014

With reference to your above letter, we are happy to permit Ms.R.Raj Thanga Rekha,M.Sc.(Nursing) 2nd year student to conduct her pilot study and followed by main study on "A study to assess the effectiveness of probiotic supplementation on level of anaemia among adolescent girls at selected school, Tiruvannamalai" at our school during May- June 2014 under the following conditions,

Terms and Conditions:

A) The candidate should strictly follow the rules and regulations of our school.
B) Whatever details collected should be presented to us for vetting before submission to the college.
C) Information so collected should be kept strictly confidential.

Thanking you

Mpl. Girls. Hr. Sec. School * Tiruvannamalai * Dt: 16/7/14

16/7/14

HEAD MASTER,
Municipal Girls Hr. Sec. School,
Tiruvannamalai - 606 601

APPENDIX – C

LETTER SEEKING EXPERTS OPINION FOR CONTENT VALIDITY

From

R. Raj Thanga Rekha,
M.Sc.(Nursing) II Year,
Vignesh Nursing College,
Tiruvannamalai.

To

Respected sir/madam,

SUB: Requisition for expert opinion for content validity.

I am a second year M.Sc (Nursing) student studying in Vignesh Nursing College, Manalurpet Road, Tiruvannamalai, under the Tamilnadu Dr.M.G.R. Medical University.

I would like to conduct "A study to assess the effectiveness of probiotic supplementation on level of anemia among adolescent girls at selected school, Tiruvannamalai".

Herewith I am sending the developed tool for content validity for your opinion and possible suggestions, I would be most obliged if you can do the needful and return it to the undersigned.

Thanking you,

Yours faithfully,

R.Raj Thanga Rekha.

Enc:

1. Research proposal
2. Research Tool and Scoring key
3. Certificate for content validity
4. Self -Addressed envelope.

LIST OF EXPERTS FOR CONTENT VALIDITY

MEDICAL EXPERTS:

1. **Dr. K. Karthikeyan M.D(Gen.med).,**
   Assistant professor,
   Dept. of Medicine,
   Govt.Tiruvannamalai Medical College & Hospital,
   Tiruvannamalai -606 601

2. **Dr.N. Karthikeyan,M.B.B.S., D.C.H.**
   T.N.K. Nursing Home,
   49,Tiruvoodal street,
   Tiruvannamalai- 606 601

NURSING EXPERTS:

1. **Mrs. Priyadharshini M.Sc(N)**
   Principal cum professor in Nursing,
   Al-Ameen College of Nursing,
   Tiruvannamalai - 606 604

2. **Mrs.N.Anitha, M.Sc.(N)**
   Professor,
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   Neikkarapatti,
   Salem-636 010

3. **Mrs. Jolly Ranjith M.Sc(N)**
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   Chennai – 600 066

4. **Ms.Sumathi, M.Sc(N)., Ph.D., (N)**
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   Head of the Department,
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6. **Mr.P.Vasanthakumar, M.Sc(N).,**
   Assistant Professor,
   Vinayaka Mission of Nursing,
   Karikal-609 602

DIETICIAN

1. **Dr.Mrs.P.V.Lakshmi,**
   Dietician,
   Global Health City,
   Chennai.

CERTIFICATE FOR ENGLISH EDITION

TO WHOM SO EVER IT MAY CONCERN

This is to certify that the dissertation work **" A study to assess the effectiveness of Probiotic supplementation on level of anaemia among adolescent girls at selected school, Tiruvannamalai"**, done by Ms. R. RAJ THANGA REKHA , II year, M.Sc.(Nursing), student of Vignesh Nursing College, Tiruvannamalai,is edited for English language appropriateness.

Seal with Date: 15/12/14

Y.JAYARAJ SAMUEL, M.A.,M.Ed.,M.Phil.,
P.G. Assistant (English)
Shanmuga Industries
Govt. Hr. Sec. School
THIRUVANNAMALAI

Date: 15/12/2014
Pin-606 603

15/12/14

Signature

Y.JAYARAJ SAMUEL, M.A.,M.Ed.,M.Phil.,
P.G. Assistant (English)
Shanmuga Industries
Govt. Hr. Sec. School
THIRUVANNAMALAI

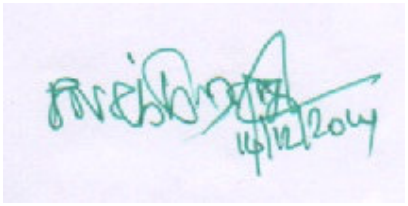
APPENDIX – E

CERTIFICATE FOR TAMIL EDITION

TO WHOM SO EVER CONCERN

This is to certify that the dissertation work **" A study to assess the effectiveness of Probiotic supplementation on level of anemia among adolescent girls at selected school, Tiruvannamalai"**, done by Ms. R. RAJ THANGA REKHA , II year, M.Sc.(Nursing) student of Vignesh Nursing College,Tiruvannamalai,is edited for Tamil language appropriateness.

K.BAKYARAJ, M.A.,M.Phil.,B.Ed.,
P.G. Asst. in Tamil,
Govt. Hr. Sec.School,
Perumkulathur-606 708. T.V.M. Dt.



Seal with date: **Signature**

APPENDIX – F

INFORMED CONSENT

Greetings,

I Ms. R.Raj Thanga Rekha, M.sc.(Nursing) II year,Vignesh Nursing College, Tiruvannamalai, has been conducting "**A study to assess the effectiveness of Probiotic supplementation on the level of Anaemia among the adolescent girls al selected school , Tiruvannamalai."** for the partial fulfillment of the requirement for the degree of M.Sc., Nursing under Tamil Nadu Dr. M.G.R. Medical University, Chennai.

As a part of research work, I need to collect a data from adolescent girls; In connection with the same, I seek your valuable support and kind cooperation to complete the frill work related to my research work in time. Further I assure you sir/madam; the information provided by you will be kept confidential and will not be disclosed at any stage. Your precious support is solicited.

Thank you.

APPENDIX – G

ஒப்புதல் படிவம்

வணக்கம்,

ர.ராஜ் தங்க ரேகா ஆகிய நான் கீழ் அனைக்கரையில் உள்ள விக்னேஷ் செவிலியர் கல்லூரியில் முதுகலை பட்டப்படிப்பு பயின்று வருகின்றேன். என் படிப்பின் ஒரு பகுதியாக வளரிளம் பெண்களிடம் ஏற்படும் இரத்த சோகையை கட்டுப்படுத்துவது பற்றிய ஆய்வை நடத்துவதற்கான கேள்விகளை வடிவமைத்துள்ளேன்.

தயவு செய்து நீங்கள் என்னுடன் ஒத்துழைக்குமாறு வேண்டிக் கொள்கிறேன். நான் உங்களிடம் இருந்து பெற்ற தகவல்களை எக்காரணத்தைக் கொண்டும் வெளியிட மாட்டேன் என்று உறுதி அளிக்கிறேன்.

நன்றி!

APPENDIX – H

PARENTS INFORMED CONSENT FORM

I understand that adolescent girls are at risk for anemia ,my daughter is also being asked to participate in a research study conducted by **Ms. R.RajThangaRekha** M.sc(Nur) student of Vignesh Nursing College,Tiruvannamalai**.** I understand that you are collecting blood samples for all adolescent girls with prior parents' permission , so I am permitting you to collect blood sample for my daughter to assess the level of anemia, I understand that there are no risks associated with this study.

I realize that, participation of my daughter in this study is entirely voluntary, and I may withdraw my daughter from the study at any time I wish. If I decided to discontinue my daughter in participation of this study, she will continue to be treated in the usual and customary fashion. I understand that all study data will be kept confidential. However, this information may be used in nursing publication or presentations. If I need to, I can contact **Ms.R.Raj Thanga Rekha.,** M.Sc.(N) II year student of Vignesh Nursing College, Kizhanaikarai, Tiruvannamalai, at any time during the study.

The study has been explained to me. I have read and understood this consent form, all of my questions have been answered, and I agree to participate my daughter in the study. I understand that I will be given a copy of this signed consent form.

----------	**----------**
Signature of Participant	**Date:**
----------	**----------**
Signature of Investigator	**Date:**

APPENDIX – I

பெற்றோரின் ஒப்பந்த படிவம்

விக்னேஷ் செவிலியர் கல்லூரியின் சார்பில் முதுநிலை பட்டப்படிப்பு பயிலும் ர.ராஜ் தங்க ரேகா அவர்களால் நடத்தபெறும் இந்த ஆய்வில் என் மகளை பங்கேற்க கேட்டுக் கொண்டதை நான் ஏற்றுக்கொள்கிறேன். இந்த ஆய்வுக்கு நான் ஒப்புக் கொண்டால் அதனைத் தொடர்ந்து உள்ள பயிற்சிகளில் என் மகள் பங்கேற்க வேண்டும் என்றும் என் மகளிடம் நடத்தும் இந்த ஆய்வு முடிவுகள் அனைத்தும் பதிவு செய்து பாதுகாக்கப்படும் என்பதை நான் அறிவேன். நான் எவரின் / யாருடைய காட்டாயத்தின் பெயரிலோ அல்லது வற்புறுத்தலின் பெயரிலோ ஆய்வில் பங்கு கொள்ளவில்லை என்பதையும் தேவைப்பட்டால் நான் ஆய்விலிருந்து விலகிக் கொள்ளும்பட்சத்திலும் எப்போதும் பிறரைப் போலவே நடத்தப்படுவேன் என்பதை அறிவேன்.

என்னைப் பற்றிய அனைத்து தகவல்களும் இரகசியமாக பாதுகாக்கப்படும் என்பதையும் தேவைப்படும் போது ஆய்வின் முடிவுகள் செவிலியர் சார்ந்த பத்திரிகைகைகளிலும், கருத்தரங்குகளிலும் வெளியிட முழு சம்மதம் அளிக்கிறேன். இந்த ஆய்வினை பற்றிய முழு விளக்கமும் எனக்கு அளிக்கப்பட்டிருக்கிறது. அதனை நான் முற்றிலுமாக புரிந்து கொண்டு ஆய்வில் என் மகள் பங்குக்கொள்ள சம்மதம் அளிக்கிறேன்.

இந்த ஆய்வில் தேவைப்படும் போது எப்போது வேண்டுமானாலும் ர.ராஜ் தங்க ரேகா அவர்களை விக்னேஷ் செவிலியர் கல்லூரியில் தொடர்பு கொள்ளலாம் என்பதை அறிவேன்.

பங்குகொள்பவரின்/பாதுகாவலரின் கையொப்பம் **தேதி:**

ஆராய்ச்சியாளரின் கையொப்பம் **தேதி:**

APPENDIX – J

SECTION A- DEMOGRAPHIC VARIABLES

Sample No.:

1. Age in years

a .14-15 years

b. 16-17 years

2. Type of family

a. Nuclear

b. Joint

c. Extended

3. Educational status of father

a. Non literate

b. Primary &middle education

c Upto higher secondary education

d. Graduate and above

4. Educational status of mother

a. Non literate

b. Primary & middle education

c. Upto Higher Secondary Education

d. Graduate and Above

5. Occupational status of father

a. Unemployed

b. Unskilled worker

c. Skilled worker

d. Professional

e. Semi skilled

6. Occupational status of mother

a. Home maker

b. Unskilled worker

c. Skilled worker

d. Professional

e. Semiskilled

7. Religion

a. Hindu

b. Muslim

c. Christian

d. Others

8. Type of Diet

a. Vegetarian

b. Non-Vegetarian

9. Monthly Income of family

a. Below Rs.5000

b. Rs.5001 to Rs.10000

c. Rs.10001 to Rs.15000

d. Rs.15001 to Rs.20000

e. Above Rs.20000

10. Source of information regarding anaemia in adolescent girls:

` a. Print media

b. Curriculum

c. Electronic media

d. Health personnel

e. Family members / relatives / Friends

11. Menstrual duration

a. <7 days

b. >7 days

12. Body Mass Index

a. <18.5

b. 18.6-24.99

c. 25-29.99

d.>30

13. Habit of drinking tea

a. Yes

b. No

14. No. of siblings

a.<2 children

b.> 3 children

15. Area of residence.

a. Rural

b. Urban.

தகவல் சேகரிப்பு கருவி

பகுதி I: தனிநபர் விவரம்

1. வயது வருடங்களில்
   - அ. 14 – 15 வருடங்கள்
   - ஆ 16 – 17 வருடங்கள்

2. குடும்ப வகை
   - அ. தனிக்குடும்பம்
   - ஆ. கூட்டுக்குடும்பம்
   - இ. நீட்டிக்கப்பட்ட குடும்பம்

3. தந்தையின் கல்வித்தகுதி
   - அ. படிக்கவில்லை
   - ஆ. ஆரம்ப மற்றும் தொடக்கக்கல்வி
   - இ. உயர்நிலைக்கல்வி
   - ஈ. பட்டடதாரி மற்றும் அதற்கு மேல்

4. தாயின் கல்வித்தகுதி
   - அ. படிக்கவில்லை
   - ஆ. ஆரம்ப மற்றும் தொடக்கக்கல்வி
   - இ. உயர்நிலைக்கல்வி
   - ஈ. பட்டடதாரி மற்றும் அதற்கு மேல்

5. தந்தையின் பணி விவரம்
   - அ. வேலையில்லை
   - ஆ. பயிற்சியற்ற வேலை
   - இ. பயிற்சிபெற்ற வேலை
   - ஈ. தொழிற்கல்வி
   - உ. அரை திறமையுடைய

6. தாயின் பணி விவரம்

அ. வேலையில்லை

ஆ. பயிற்சியற்ற வேலை

இ. பயிற்சிபெற்ற வேலை

ஈ. தொழிற்கல்வி

உ. அரை திறமையுடைய

7. மதம்

அ. இந்து

ஆ. முஸ்லீம்

இ. கிறிஸ்துவம்

ஈ. மற்றவை

8. உணவு பழக்கம்

அ. சைவம்

ஆ. அசைவம்

9. மாத வருமானம்

அ. ரூ.5000க்கும் கீழ்

ஆ. ரூ.5001 முதல் ரூ.10000

இ. ரூ.10001 முதல் ரூ.15000

ஈ. ரூ.15001 முதல் ரூ.20000

உ. ரூ.20000க்கு மேல்

10. வயது வந்த பெண்களிடையே இரத்தசோகைக்கான முந்தய அறிவுத்திறன்

அ. பத்திரிகை

அ. பாடத்திட்டம்

இ. மின்னணு ஊடகங்கள்

ஈ. சுகாதார பணியாளர்கள்

உ. குடும்பத்தினர்/உறவினர்கள்/நண்பர்கள்

11. மாதவிடாய் காலம்

அ. <7 நாட்கள்

ஆ. >7 நாட்கள்

12. உடல்நிறை குறியீட்டெண்

அ. <18.5

ஆ. 18.6 – 24.99

இ. 25 – 29.99

ஈ. >30

13. தேநீர் அருந்தும் பழக்கம்

அ. ஆம்

ஆ. இல்லை

14. உடன்பிறந்தவர்கள் எண்ணிக்கை

அ. <2 குழந்தைகள்

ஆ. >3 குழந்தைகள்

15. வசிக்கும் இடம்

அ. கிராமம்

ஆ. நகரம்

APPENDIX – K

CODING FOR DATA COLLECTION

	CODE NO:
1. Age in years	
a .14-15 years	1
b.16-17 years	2
2. Type of family:	
a. Nuclear	1
b. Joint	2
c. Extended	3
3. Educational status of father:	
a. Non literate	1
b. Primary &middle education	2
c. Upto higher secondary education	3
d. Graduate and above	4
4. Educational status of mother:	
a. Non literate	1
b. Primary & middle education	2
c. upto higher Secondary Education	3
d.Graduate and Above	4
5. Occupational status of father:	
a. Unemployed	1
b Unskilled worker	2
c. Skilled worker	3
d. Professional	4
e. Semi skilled	5

6. Occupational status of mother:

a. Home maker	1
b. Unskilled worker	2
c. Skilled worker	3
d. Professional	4
e. Semi skilled	5

7. Religion:

a. Hindu	1
b. Muslim	2
c. Christian	3
d. Others	4

8. Type of Diet:

a. Vegetarian	1
b. Non-Vegetarian	2

9. Monthly Income of family:

a. Below Rs.5000	1
b. Rs.5001 to Rs.10000	2
c. Rs.10001 to Rs.15000	3
d. Rs.15001 to Rs.20000	4
e. Above Rs.20000	5

10. Source of information regarding anaemia in adolescent girls:

a. Print media	1
b. Curriculum	2
c. Electronic media	3
d. Health personnel	4
e. Family members / relatives / Friends	5

11. Menstrual duration

a.<7 days	1
b.>7 days	2

12. Body Mass Index

a. <18.5	1
b. 18.6-24.99	2
c. 25-29.99	3
d.>30	4

13. Habit of drinking tea

a. Yes	1
b. No	2

14. No. of siblings

a. <2 children	1
b. >3 children	2

15. Area of residence.

a. Rural	1
b. Urban.	2

SECTION B: INTERVENTION TOOL FOR ASSESSING LEVEL OF ANAEMIA

Assessed the level of Anaemia using Cyanmethaemoglobin method.

SCORING KEY:

Anaemia is graded by WHO cut off scores

Level	**WHO (Hb, g/dl)**
Level 0 (normal)	≥ 11
Level I (mild)	9.5-10.9
Level II (moderate)	8.0-9.4
Level III (Severe)	6.5-7.9
Level IV (extremely severe)	<6.5

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